

Higher Education in the World 7

Humanities and Higher Education: Synergies between Science, Technology and Humanities

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3Os	Open Science, Open Innovation, Open to the World	CNRI	National Research Council of Italy
AAAS	American Association for the Advancement of Science	CNRS	National Scientific Research Council (France)
ACM	Association for Computing Machinery	COB	Oceanographic Centre of the Balearic Islands
ACU	Association of Commonwealth Universities	COMBINE	Complementary Methods in Evaluation Research
ACUP	Association of Catalan Public Universities	CONACYT	National Council of Science and Technology of Mexico
ADN	Asia Democracy Network	CONICET	National Council of Scientific and Technical Research of Argentina
ADRN	Asia Democracy Research Networks	CoPs	Communities of Practice
AECHE	Arab-Euro Conference on Higher Education	CPN	Center for the Promotion of Science
AERC	African Economic Research Consortium	CRAI	Resource Center for Learning and Research
AI	Artificial Intelligence	CRES	Regional Conference on Higher Education in Latin America and the Caribbean
AMC	Mexican Academy of Sciences	CRUE	Spanish Conference of Rectors
AMH	Academy of Mobility Humanities	CSIC	Superior Council of Scientific Research of Spain
AMHN	Asia Mobility Humanities Network	CSO	Civil Society Organization
AMRUT	Atal Mission for Rejuvenation and Urban Transformation	CVD	Cardiovascular Disease
APU	Ritsumeikan Asia Pacific University	DHET	Department of Higher Education and Training
AQuAS	Agency for Health Quality and Assessment of Catalonia	DIY	Do It Yourself
ASD	Autism Spectrum Disorder	DoE	Department of Education
AWMF	Andrew W. Mellon Foundation	DOI	Digital Object Identifier
BG	Business Games	DORA	Declaration on Research Assessment
BISS	Barcelona International Summer School	DUT	Durban University of Technology
BMAS	German Federal Ministry of Labour and Social Affairs	EASSH	European Alliance for Social Science and Humanities
BOAI	Budapest Open Access Initiative	EC	European Commission
C3	Center for Complexity Sciences	ECLAC/CEPAL	Economic Commission for Latin America and the Caribbean
CAHS	Canadian Academy of Health Sciences	ECRC	Engaged Citizens, Responsive City
CBOs	Community Based Organisations	ECRs	Early Career Researchers
CBPR	Community Based Participatory Research	ECSA	European Citizen Science Association
CE	Community Engagement	ECTS	European Credit Transfer and Accumulation System
Cedefop	European Center for the Development of Vocational Training	EE	Environmental Education
CEIPAC	Center for the Study of Provincial Interdependence in Ancient Classics	EGERA	Effective Gender Equality in Research and the Academia
CERN	European Organization for Nuclear Research	EH	Environmental Humanities
CfH	Center for the Humanities	EHEA	European Higher Education Area
CGE	Center for Global Engagement	EHL	Environmental Humanities Laboratory
CHCI	Consortium of Humanities Centers and Institutes	EIA	Engagement and Impact Assessment
CHE	Center for Culture, History and the Environment	EMI	English-Medium Instruction
CHR	Centre for Humanities Research	ENRESSH	Evaluative Research in the Social Sciences and Humanities
CLACSO	Latin American Council of Social Sciences	ENST-Bretagne	National School of Telecommunications of Brittany
CNPEM	Brazilian Center for Research in Energy and Materials		

EOCGE	Employer of Choice for Gender Equality	IBEI	Barcelona Institute of International Studies
EOSC	The European Open Science Cloud	IBSE	Inquiry-Based Science Education
EPNet	Economic and Political Network	IC	Institutional Change
ERA	European Research Area	ICAEN	Catalan Institute for Energy
ERA	Excellence in Research Australia	ICO	Oncology Institute of Catalonia
ERC	European Research Council	ICOM	International Council of Museum
ERP	Enterprise Resource Planning	ICRA	International Conference on Robotics and Automation
ESA	European Space Agency	ICT	Information and Communication Technology
ESD	Education for Sustainable Development	IDRC	International Development Research Center
ESFRI	European Strategy Forum on Research Infrastructures	IEEE	Institute of Electrical and Electronic Engineers
ESO	European Southern Observatory	IEO	Spanish Institute of Oceanography
ESTEAM	Ethics, Science, Technology, Arts, Engineering and Mathematics	IESALC	International Higher Education Institute for Latin America and the Caribbean
EU	European Union	IIHed	The International Institute for Higher Education Research and Capacity building
EUA	European University Association	IIUSE	Research Institute on University and Education
EUFP	European Union Framework Programme	IUM	International Islamic University Malaysia
Euratom	European Atomic Energy Community	ILO	International Labour Organization
FAIR	Findable, Accessible, Interoperable, Re-Usable	IMEDEA	Mediterranean Institute for Advanced Studies
FLACSO	Latin American Faculty of Social Sciences	IoT	Internet of Things
FNU	Fiji National University	IRH	Institute for Research in the Humanities
FPIC	Free, Prior and Informed Consent	IRI	Institute of Industrial Informatics and Robotics
FPs	Framework Programmes	IROS	International Conference on Intelligent Robots and Systems
FTA	Free Trade Agreements	ISA	Higher Institute of Arts of Cuba
FTAA	Free Trade Area of the Americas	ISRIA	International School on Research Impact Assessment
GAFA	Google, Apple, Facebook and Amazon	ISS	Institute of Social Studies
GAMe	Young Mediterranean Ambassadors Group	ITP	Interactive Telecommunications Program
GCEP	Global Competency Enhancement Programme	ITU	International Telecommunication Union
GEP	Gender Equality Policy	JGU	O.P. Jindal Global University
GHG	Greenhouse Gases	JIBS	Jindal Institute of Behavioural Sciences
GIS	Geographic Information Systems	JIRICO	Jindal Initiative on Research in IP and Competition
GM Foods	Genetically Modified	JMU	James Madison University
GS	Global Situation	JRC	Joint Research Centre
GUNi	Global University Network for Innovation	JSiE	Jindal Centre for Social Innovation and Entrepreneurship
GWd	Gigawatt-days	K4C	Knowledge for Change
HAT	Humanities, Arts, Technology	KPI	Key Performance Indicator
HEIs	Higher Education Institutions	KTH	Royal Institute of Technology
HEIW	Higher Education in the World Report	LBGTQ	Lesbian, Bisexual, Gay, Transgender, Queer
HESP	Hispanic and European Studies Program	LBGTQIA	Lesbian, Bisexual, Gay, Transgender, Queer, Intersex, Asexuality
HfE	Humanities for the Environment Observatories	LERU	League of European Research Universities
HLW	High-Level Waste		
HPV	Human Papillomavirus Infection		
HR	Human Resources		
IAEA	International Atomic Energy Agency		
IAEN	National Institute of Higher Studies		
IAS	Institute for Advanced Study		
IAU	International Association of Universities		

LIBER	Association of European Research Libraries	PUCE	Pontifical Catholic University of Ecuador
LINCC	Laboratory on Climate Change	R&D	Research and Development
LNNano	Brazilian Nanotechnology National Laboratory	R&I	Research and Innovation
LWR	Light-Water Reactor	RCC	Rachel Carson Center for Society and the Environment
MCU	Magna Charta Universitatum		
MECD	Ministry of Education, Culture and Sports	RCUK	Research Councils United Kingdom
MED-HUB	Knowledge Hub on the Euro-Mediterranean region	REF	Research Excellence Framework
MENA	Middle East and North Africa	RIA	Research Impact Assessment
MESA	Mainstreaming Environment and Sustainability in African Universities	RMEI	Network of Mediterranean Engineering Schools
MHE	Mobility Humanities Education Center	RRI	Responsible Research and Innovation
MIT	Massachusetts Institute of Technology	RTDI	Research, Technology Development and Innovation
MNAC	National Museum of Art of Catalonia		
MOOC	Massive Online Open Course	SAHECEF	South African Higher Education Community Engagement Forum
MSCA	Marie Skłodowska-Curie Actions	SAQA	South African Qualifications Authority
MSD	Musculoskeletal Disorder	SBM-U	Swachh Bharat Mission – Urban
MSESD	Mediterranean Strategy on Education for Sustainable Development	SDGCA	Sustainable Development Goal Center for Africa
MTG	Music Technology Group	SDGs	Sustainable Development Goals
NEET	Not in Education, Employment or Training	SEA	Andorra's Educational System
NGO	Non-Governmental Organization	SEBD	Spanish Society of Developmental Biology
NKUA	National Kapodistrian University of Athens	SEKCI	Organic Code on the Social Economy of Knowledge, Creativity and Innovation
NPO	Non-Profit Organisation		
NSB	National Science Board	SEP	Standard Evaluation Protocol
NSF	National Science Foundation	SET	Students' Evaluations of Teachers
NUI	National University of Ireland	SF	Science Fiction
NWO	Netherlands Organisation for Scientific Research	SHTEAM	Science, Humanities, Technology, Engineering, Arts and Medicine
OECD	Organisation for Economic Cooperation and Development	SICs	Settlement Improvement Committees
OFCE	French Economic Observatory	Sida	Swedish International Development Agency
OIP	Office of International Programs	SiS	Science in Society
ORCID	Open Researcher and Contributor ID	SKB	Swedish Nuclear Waste Management
OSPP	Open Science Policy Platform	SMAC	Social, Mobile, Analytics and Cloud
PAR	Participatory Action Research	SMEs	Small and Medium Sized Enterprises
PCT	Patent Cooperation Treaty	SNF	Spent Nuclear Fuel
PERMSEA	Strategic Plan for the Overhaul and Improvement of Andorra's Education System	SOAS	School of Oriental and African Studies
PISA	Participant Platform for Innovation, Social Inclusion and Active citizenship	SRIA	Strategic Research and Innovation Agenda
PRESAGE	Research and Teaching Program of Knowledge on Gender	SSH	Social Sciences and Humanities
PRIA	Participatory Research in Asia	STEAM	Science, Technology, Arts, Engineering and Mathematics
PRIMA	Partnership for Research and Innovation in the Mediterranean Area	STEM	Science, Technology, Engineering and Mathematics
PRIU	Regional Platform for University Integration	STS	Science-Technology Studies
PSE	Participatory Settlement Enumeration	SUNY	State University of New York
PSET	Post School Education and Training	SwafS	Science with and for Society
PUA	Participatory Urban Appraisal	TARGET	Taking a Reflexive Approach to Gender Equality for Institutional Transformation in Mare Nostrum
		TCNJ	The College of New Jersey

TDR	Teacher Design Research	UniRitter	Ritter dos Reis University Center
TEACHENER	Integrating Social Sciences and Humanities into Teaching about Energy	UNLP	National University of La Plata
TeRRIFICA	Territorial Responsible Research and Innovation Fostering Innovative Climate Action	UNRISD	United Nations Research Institute for Social Development
TFP	Total Factor productivity	UNU-EHS	United Nations University Institute for Environment & Human Security
THE	Times Higher Education	UNU-WIDER	United Nations University World Institute for Development Economics Research
tHM	Tonne of Heavy Metal	UOC	Open University of Catalonia
TMX	Translation Memory eXchange	UoN	University of Nairobi
TVET	Technical Vocational Education and Training	UoTs	Colleges and Universities of Technology
UAB	Autonomous University of Barcelona	UPC	Polytechnic University of Catalonia-BarcelonaTech
UAM	Autonomous University of Madrid	UPF	Pompeu Fabra University
UAZ	Autonomous University of Zacatecas	UPV	University of the Basque Country
UB	University of Barcelona	URV	Rovira i Virgili University
UBA	University of Buenos Aires	USIM	Board of Directors for Islamic Science University Malaysia
UCL	University College of London	USM	University Sains Malaysia
UCLA	University of California, Los Angeles	USP	University of the South Pacific
UdeG	Universidad de Guadalajara	UVic	Vic University
UdG	University of Girona	UWC	University of the Western Cape
UdL	University of Lleida	VESS	Meaningful Life with Balance and Wisdom
UEA	University of East Anglia	VET	Vocational Education and Training
UEMF	EuroMediterranean University Fes	WEF	World Economic Forum
UfM	Union for the Mediterranean	WHO	World Health Organisation
UFZ	Helmholtz Centre for Environmental Research	WIPO	World Intellectual Property Organization
UIB	University of the Balearic Islands	WP	Work Programmes
UIC	International University of Catalonia	WTO	World Trade Organization
UID	Unique Identification Document	WW2	World War Two
UMAC	University Museums and Collections		
UN	United Nations		
UNA	National Arts University		
UNAE	National University of Education of Ecuador		
UNAM	National Autonomous University of Mexico		
UNAN	National Autonomous University of Nicaragua		
UNASUR	Union of South American Nations		
UNDESD	United Nations Decade of Education for Sustainable Development		
UNDP	United Nations Development Program		
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples		
UNE	United Nations Environment		
UNEARTE	National University of Experimentation of the Arts		
UNESCO	United Nations Educational, Scientific and Cultural Organization		
UNFCCC	United Nations Framework Convention on Climate Change		
Unicamp	University of Campinas		
UNICEF	United Nations Children's Fund		
UNIMED	Mediterranean Universities Union		

About the Authors

Dzulkifli Abd Razak is the Rector of the International Islamic University Malaysia. He is the former president of the International Association of Universities (IAU), a UNESCO-based organization located in Paris. He was also the Chair of the Board of Directors for Islamic Science University Malaysia (USIM), and held the chair of Islamic Leadership at USIM from 2014-16. He is an honorary professor at the University of Nottingham. He also chairs the steering council of the Right Livelihood College Global Secretariat based at the University of Bonn, Germany, and the Malaysian Productivity Centre Panel for Productivity Culture. He was the 5th vice-chancellor of Universiti Sains Malaysia (USM) from 2000 to 2011. He was awarded an Emeritus Professorship by the USM in honour of his immense scholarship and contributions to the university.

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Manale Adanane was born in Meknes and is currently living in Fes in order to pursue her studies at the Euro-Mediterranean University of Fes. In 2017 she received a scientific bachelor's degree in physics with the highest honours. Aiming to become an architect, she successfully passed the entrance exam to get into the UEMF School of Architecture, Design and Urbanism: EMADU; which she joined in September 2017 on a scholarship that was renewed after being one of the top students in her class. Currently a second year architecture student, she is also very active in several clubs, including the music club, the debating club and others.

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Martín Barajas was born in the city of Guadalajara, Jalisco (Mexico), which is where he attended school. After graduating in 1980 with a Bachelor's Degree in Dental Surgery, in 1981 he became a full-time professor of clinical practice, an activity that he still performs today. In 2004, he obtained a Master's Degree in Education with Intervention in Educational Practice and in 2012 completed 100% of the credits for a PhD in Education Sciences. For the last 16 years, he has been working as an advisor on Planning and Coordination to the University Centre of Health Sciences (CUCS) at the University of Guadalajara, as well as serving as a full-time professor at that university, where he has been recognised for his Desirable Profile by the Program for the Professional Development of Teaching. He has participated in several high-impact tasks, of particular note being the 22 years served as a member of the Advisory Board to the Degree in Dental Surgery taught at the CUCS. He was involved in the draft of the 2014-2030 CUCS Institutional Development Plan, as well as being the author or co-author of several scientific publications.

Martín Enrique Barajas is a native of the city of Guadalajara, Jalisco (Mexico), where he received all of his school and academic training. In 2010 he became an undergraduate student of Dental Surgery and received the corresponding degree in April 2015. His many academic activities have included co-authorship of two editions of the book "Fundamentos en Endodoncia", which forms part of the basic bibliography for the Pro-paedeutics course in the Endodontics speciality at the University of Guadalajara. He has also provided support in various academic roles to the management of the Department of Dentistry for the Preservation of Health at the University Centre of Health Sciences (CUCS) at the University of Guadalajara. In April of the current year he joined the academic staff in the Department of Comprehensive Dental Clinics at the CUCS, working as an 'A' Associate Academic Technician (Full Time) to offer clinical guidance to students on the Dental Surgery degree when performing dental treatments in the field of Periodontics.

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Rosi Braidotti is a Philosopher and Distinguished University Professor at Utrecht University and director of the Centre for the Humanities in Utrecht. She has taught at the University of Utrecht in the Netherlands since 1988, when she was appointed as the founding professor of women's studies. In 1995 she became the founding Director of the Netherlands research school of Women's Studies, a position she held until 2005. She was a Leverhulme Trust Visiting Professor at Birkbeck College in 2005-6; a Jean Monnet professor at the European University Institute in Florence in 2002-3 and a fellow in the school of Social Science at the Institute for Advanced Study in Princeton in 1994. Influenced by philosophers such as Gilles Deleuze and especially "French feminist" thinker Luce Irigaray, Braidotti has brought postmodern feminism into the Information Age with her considerations of cyberspace, prosthesis, and the materiality of difference. Braidotti also considers how ideas of gender difference can affect our sense of the human/animal and human/machine divides. Braidotti has also pioneered European perspectives in feminist philosophy and practice and has been influential on third-wave and post-secular feminisms as well as emerging posthumanist thought.

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Marina Garcés is a philosopher and full university professor. After fifteen years at the University of Zaragoza, she is currently an associate professor at the Open University of Catalonia, where she manages the Masters in Philosophy for contemporary challenges. Her latest books are *Un mundo común* (Bellaterra, 2012) *Filosofía inacabada* (Galaxia Gutenberg, 2015), *Fuera de clase* (Galaxia Gutenberg, 2016), *Nueva ilustración radical* (Anagrama, 2017, Ciutat de Barcelona Essay Award 2017) and *Ciudad princesa* (Galaxia Gutenberg, 2018). Since 2002, she has also been working on the collective thinking programme titled *Espai en Blanc*. She believes in the statement of commitment to life as a shared problem and her philosophy involves widespread experimentation with ideas, learning and ways of intervening in our modern world.

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Gloria Jové has focused her scientific career on teacher training based on inclusive schools. She started her scientific production in critical pedagogy and action research, looking at ways to change educational models that do not help people processes. Since 2007, she and her research team have learned to communicate and think about art, especially contemporary art, to expand knowledge, and become aware of the heterogeneous training processes within higher education. This has enabled her research to expand on a methodology based on how learning around art, through inter and transdisciplinarity practices and using the community resources offered by the territory and public space, can be used in training and make us thoughtful, creative, critical, inclusive and professional teachers.

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Carles Lalueza-Fox is a Research Professor at the Institute of Evolutionary Biology (CSIC-UPF). He is a leading scientist in Europe on paleogenetics, and one of the few experts in the field that has been active since the mid-nineties. His research covers several lines, including the phylogenetic analysis of some extinct species, the genomic analysis of human populations of the past -including archaic hominids such as Neanderthals- and the retrieval of ancient pathogens. He also participated in the Neanderthal Genome Project. He has published more than 130 scientific papers, including several in *Nature*, in *Science* and in *PNAS*, which are considered the three main generalist science journals. In addition to his work as a researcher, Lalueza-Fox is committed to science outreach and has published eleven popular science books, mainly on diversity and racism, ancient DNA, Neanderthal genomics and De-extinction.

Aurora Lechuga is studying for a PhD in Pedagogy at the Autonomous University of Mexico (UNAM) at Ciudad Universitaria. He has masters and bachelor's degrees in Pedagogy from the same university. He has attended national and international conferences in Ecuador and Argentina on the subject of Artistic Education. He is currently conducting a research project on education for public universities of the arts in Latin America and the Caribbean, namely La Universidad Nacional de las Artes (UNA), Argentina, El Instituto Superior de Artes (ISA), Cuba, La Universidad de las Artes (Arte y Cultura), (UARTES) and La Universidad Nacional de Experimentación de las Artes (UNEARTE), Venezuela. The study forms part of the UNESCO Chair on "University and Regional Integration" Seminars directed by Dr. Axel Didriksson Takayanagui.

Marta Llop began her career as a Social Sciences teacher (1985-1990). She then went on to become Head of Andorra's Education Department (1990-2004), head of studies at Santa Coloma Secondary School in Andorra (2004-2014); and a teaching specialist under the PERMSEA strategic plan (2014-2018). In the current 2018-19 academic year, she is combining her work as a teaching specialist and head of studies. Author and/or coordinator of a number of education-related publications in the field of social sciences for Andorra's

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Fatima Marinho is a Full Professor in the University of Porto. She was Vice-President of the University of Porto (June 2014 – June 2018) and Dean and President of the Scientific Board of the Faculdade de Letras [Faculty of Humanities and Social Sciences], (2010 – 2014). She is a Member of the IAU (International Association of Universities) Administration Board (2016-2020), expert on the Haut Conseil de l'Évaluation de la Recherche et de l'Enseignement Supérieur, France (2017) and of the Evaluation and Accreditation Agency for Higher Education, Portugal (2018). The French Government honored her with the title of «Officier de l'Ordre des Palmes Académiques» (November 2015). Her field of interest is Portuguese Literature (Historical Novels and Portuguese 20th century Poetry). She has appeared at many conferences in several countries and has authored several publications (books, book chapters and papers in journals).

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Federico Mayor Zaragoza is a Spanish scientist, politician, scholar and social change activist. Director-General of UNESCO (United Nations Educational, Scientific, and Cultural Organization, 1987-1999). He was originally a professor of Biochemistry at the University of Granada, where he later held the post of Chancellor (1968-1972). He pioneered neonatal diagnosis and the treatment of diseases that can lead to irreversible neonatal damage. At the Autonomous University of Madrid (UAM) in 1973 he was the Co-founder of the Centre of Molecular Biology "Severo Ochoa". Minister of Education and Science (1981). Chair of the European Research Council Expert Group (2003). Co-President of the Commission that gave rise to the UN Alliance of Civilizations Programme (2006). Chair of the International Commission against the Death Penalty (2010-2017). At the UAM in 2016 he set up the Institute of Human Rights, Democracy, Culture of Peace and Non-Violence (DEMOS-PAZ).

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Piotr Stankiewicz is a PhD – sociologist, assistant professor at Nicolaus Copernicus University in Torun (Poland) and director of Educational Research Institute in Warsaw. Coordinator of the educational project TEACHENER: Integrating Social Sciences and Humanities into Teaching about Energy. The project aims to fill the gap between social sciences and humanities and energy teaching at universities in Europe, by transposing social sciences and humanities knowledge to the domain of higher technical education. The project is conducted by a partnership of seven SSH and technical higher education institutions from Poland, Spain, Germany and the Czech Republic and financed within the Erasmus+ scheme.

Lee Sternberger is Associate Provost in Academic Affairs and Executive Director of the Office of International Programs (OIP). She leads a campus-wide effort to internationalize university curricula, services and programs, and coordinates global and international activities across JMU's seven colleges. Dr. Sternberger earned her B.A. in Economics from the University of Missouri (Columbia), her M.S. and Ph.D. in Clinical Psychology from Washington State University, and an M.A. in Architectural History from the University of Virginia; she has

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Rajesh Tandon is a doctor and internationally acclaimed leader and practitioner of participatory research and development. He founded the Society for Participatory Research in Asia (PRIA), a voluntary organization providing support to grassroots initiatives in South Asia, and has continued to be its chief officer since 1982. In 2012, he was appointed co-chair of the UNESCO Chair on Community Based Research and Social Responsibility in Higher Education, which is an outcome of and supports UNESCO's global mission to play 'a key role in assisting countries to build knowledge societies'. Tandon has authored more than 100 articles, a dozen books and numerous training manuals on democratic governance, civic engagement, civil society, governance and management of NGOs, participatory research and people-centred development.

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Sandra Torlucci is Vice-Chancellor of the National Arts University (UNA), where she has also served as Dean of the Dramatic Arts Department. Prior to this, she worked as Academic Secretary of the Master's Degree on Cultural Management (FFyL- UBA). She currently presides over the Commission on Institutional Relations of the National Inter-University Council and formed part of the CRES 2018 Organizing Committee. She works as a lecturer and researcher in the field of Semiotics and the Theory of Drama and Audiovisual Arts, activities she carries out at UNA, Buenos Aires University and the Cinema University, among other institutions. She is the director of research projects associated with performing arts and body configurations on stage, having produced a large number of essays and articles. She is also a scriptwriter, playwright and theatre director.

Carme Torras is a Research Professor at the Spanish Scientific Research Council (CSIC), and Head of the Perception and Manipulation group at the Robotics Institute in Barcelona. She received M.Sc. degrees in Mathematics and Computer Science from the University of Barcelona and the University of Massachusetts - Amherst, respectively, and a Ph.D. degree in Computer Science from the Polytechnic University of Catalonia (UPC). Prof. Torras has published five books and about three hundred papers in the areas of robot kinematics, computer vision, geometric reasoning, machine learning and manipulation planning. She has supervised 18 PhD theses and led 16 European projects, the latest being the Chist-Era project I-DRESS, the H2020 project IMAGINE, and her ERC Advanced Grant project CLOTHILDE – Cloth manipulation learning from demonstrations. She is a EurAI Fellow (2007), member of Academia Europaea (2010), and member of the Royal Academy of Sciences and Arts of Barcelona (2013). She has received the Dissemination Award from the Barcelona Science Museum, and the Narcís Monturiol Medal from the Government of Catalonia. Carme Torras is also a fiction writer and has published four novels in Catalan, for which she has been awarded several literary distinctions. Convinced that science fiction can help promote ethics in robotics and new technologies, one of her novels - winner of the Pedroló and Ictineu awards - has been translated into English with the title “The Vestigial Heart” (MIT Press, 2018) and published together with online materials to teach a course on Ethics in Social Robotics and AI. Further information at <http://www.iri.upc.edu/people/torras>

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Crystal Tremblay is a social geographer and community-based scholar with interests in the areas of environmental sustainability, participatory resource governance and critical pedagogy. She specializes in using participatory video and arts-based methods for creative citizen engagement and the co-creation of knowledge leading to environmental and social equity. In her capacity as Special Advisor on Community Engaged Scholarship, she provides leadership and research in support of UVic’s community engagement portfolio. She has published widely on topics related to university community research partnerships, training in community-based research, social innovation and participatory policy in water and waste governance.

Judith Urbano received a PhD in Art History from the University of Barcelona with a dissertation on the life and work of the architect August Font Carreras (1845-1924). She has been the Dean of the Faculty of Humanities at the Universitat Internacional de Catalunya (UIC Barcelona) since 2016 and Director of the Research Group on History, Architecture and Design since 2013. Her expertise is in the fields of 19th Century Architecture (Historicism, Eclecticism and Art Nouveau), Catalan “Modernisme”, Avant-garde Movements and Women Artists. She has been curator of several exhibitions: Gaudí in Paris 1910 (2001), La Mansana de la Discòrdia (2015), La Casa Gralla (2016) and editor of its catalogues. She has written several books, chapters and articles on art history and architecture of the nineteenth and early twentieth centuries.

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Josep M. Vilalta is Director of the Global University Network for Innovation (GUNI) and Executive Secretary of the Catalan Association of Public Universities (ACUP). Specialist in public management and public policies and in higher education and research management, he holds an experience of thirty years on different leading positions on public sector organizations as well as on different higher education institutions. He has promoted and participated in various projects and groups of experts of the Government of Catalonia and the Government of Spain, the European Commission, the OECD, UNESCO, and several countries in education and universities, political science and public policy management. He has published nearly a hundred papers for journals and publications, book chapters and books on public administration, public policy, education, universities and scientific research policy. He is member of the group of experts of the Spanish university policy think tank *Studia XXI*, member of the Advisory Boards of *Fundació iSocial* and *‘El Diari de l’Educació’*. He is a regular contributor to different national and international publications and to the newspapers *ARA*, *NacióDigital* and *La Vanguardia*. He holds a Degree in Geography and History (UB), a Master in Public Management (UAB), a Master in Political and Social Theory (UPF) and a Postgraduate in Management of Higher Education (Open University/Universiteit Twente). He has been promoter and director of the Master of Management and University Policy at UPC and visiting professor in different institutions.

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Richard Watermeyer is a sociologist of higher education policy, practice and pedagogy. His new book, *‘Competitive Accountability in Academic Life’* (Cheltenham: Edward Elgar) considers the deleterious effects of systematic manipulation of research governance technologies by academics and their institutions. He argues that competitive accountability produces performance based anxieties that are corruptive to the self-concept of academics as public intellectuals and which in turn engender counterfeit rationalisations of the public value of academic research. Richard is a Reader and Director of Research within the Department of Education at the University of Bath, UK.

Peter J. Wells is Chief of the Section for Higher Education at the UNESCO Headquarters in Paris, which is responsible for the overall coordination of the UNITWIN/UNESCO Chairs program. The Section’s other activities include: promoting quality enhancement and assurance mechanisms for higher education institutions (HEIs) and systems; the internationalization of higher education programs through the mobility of students and researchers facilitated by the five UNESCO Regional Recognitions of HE Qualifications; and the widening of access to quality HE and increasing of lifelong learning opportunities at HEIs through systematic approaches to ICT enabled learning (including open and distance learning, the promotion of MOOCs and Open Education resources). Before taking on his role as Chief of Section at UNESCO, Wells was Director of Bucharest College (BPTC), Higher Education Programme Specialist at UNESCO, Academic supervisor at Higher Colleges of Technology, Lecturer at the Polish Open University, Special Education Consultant at the Council on Foreign Relations and Political Risk Analyst at Euler Hermes. Wells holds a BA in European Studies from the University of Leicester, an MSc in International Relations and Affairs from Florida State University and is a Doctor of Philosophy in Quality Enhancement in Tertiary Education from Lucian Blaga University of Sibiu.

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GUNi Presentation

Global University Network for Innovation (GUNi): Twenty Years at the Service of Progress and Innovation in Higher Education around the World

The Global University Network for Innovation (GUNi) was created in 1999, one year after the first UNESCO World Conference on Higher Education in Paris. One of its main goals was to continue and facilitate the development of the agreements of that World Conference, at a time of clear expansion of higher education throughout the world. GUNi was promoted by UNESCO itself, by the United Nations University (UNU) and by the Polytechnic University of Catalonia (UPC). Five years ago, in 2014, through an agreement with UNESCO, the Catalan Association of Public Universities (ACUP) was granted its presidency and permanent secretariat. This year we are commemorating, with modesty and much shared responsibility, twenty years of one of the world's most active networks in analysis, debate and public policy in the field of higher education and university management. Twenty years in which our network has been growing in status around the world, under the approval and guidelines of UNESCO itself, driven decidedly by local institutions (in Barcelona, Catalonia and Spain as a whole) and in increasing interaction with GUNi regional offices in various regions of the world.

GUNi's main mission remains in full force (and is maybe now more necessary than ever), namely to strengthen the role of higher education in society, and help to renew its goals and policies worldwide from the perspective of public service, relevance and social responsibility.

GUNi's main goals are as follows:

- To encourage Higher Education Institutions to reorient their roles in order to broaden their social value and contribution, and strengthen their critical stance within society;
- To help bridge the gap between developed and developing countries in the field of higher education,

fostering capacity building and cooperation and in fully engagement with the 2030 Agenda;

- To promote the exchange of resources, innovative ideas and experiences, while allowing for collective reflection and co-production of globally relevant knowledge on emerging issues in higher education, innovation, social responsibility.

Today, GUNi has more than 220 members from 80 countries around the world, including higher education institutions, UNESCO Chairs, research centres and university networks related to innovation and social commitment.

Of the main activities that the network conducts on a year-to-year basis, we highlight five as listed below:

- World Higher Education reports, such as the one in your hands now, which have become key publications for analysis, debate and public policy on emerging issues in university politics around the world;
- Conferences, seminars and workshops, held on a regular basis both at its headquarters in Barcelona and in other cities and universities around the world;
- Projects promoted both internationally by the secretariat itself, and others attending to proposals from different members or regions in the world;
- The promotion of the different regional networks, attending to their specificities, problems and needs;
- Management and dissemination of knowledge in the field of policies and the management of higher education in the broadest sense, through the GUNi website, regular newsletters, social networks and other face-to-face or virtual methods.

Undoubtedly, today's world is facing a series of major planetary and social challenges of increasing complexity and dynamism: the climate crisis, the globalisation of economies and markets, social inequalities, poverty and migration, the crisis of democracy and public institutions, world governance, technological and digital change, highly changeable employment, and so on. We are therefore witnessing a real change of era. With regard to the world of education in general and specifically higher education, this context often implies

rethinking the social mission of universities, their core activities, their organisation (structures, personnel and talent, finances, operational management, autonomy and freedom, partnership and competition), their ability to respond, equality, social responsibility and the impact of their academic activity.

It is in this context that GUNi, twenty years after its creation, is strategically reappraising its role in the global change of era that we are witnessing, in order to become a global trendsetter as a network for analysis, debate and policy in the field of higher education and university management. For example, in 2016 GUNi set up a new strategic area based on the implementation of 2030 Agenda and the UN Sustainable Development Goals (SDGs) in the field of higher education and scientific research. GUNi is seeking to thereby become one of the world's benchmark networks in the deployment of the 2030 Agenda and the SDGs in terms of higher education and research. That is why it holds a biennial International Conference on the SDGs and higher education, has an International Group of Experts on the SDGs and higher education, and regularly drafts reports and studies in this field.

Another new strategic area is the social responsibility of higher education institutions in the new century, which have come to light in recent years in the form of activities and projects on responsible research and innovation (RRI), the challenge of climate change and the role of universities and research, and local-global tension in higher education. Finally, in relation to the Report that you are holding in your hands, GUNi advocates for in-depth reflection on classic academic disciplines, their organisation and their compartmentalisation and is hence proposing that interrelations and joint ventures between the sciences, technology and humanities need to be fostered in order to produce new forms of education, scientific research and collaboration with society.

Twenty years on, in full responsibility and based on all of the progress made thus far, at GUNi we feel strong enough to reinvent ourselves and intensify our role in analysis, debate and proposal at the service of progress and innovation in higher education around the world. We invite you to join us, with the firm intention of working together to forge greater progress, well-being and global justice in our societies.

Josep M. Vilalta
GUNi Director

UNESCO's Introduction

By their very nature, institutions of higher learning provide a space for the widest exploration of knowledge exchange and debate across every field of human enquiry. The universality of the university is thus still sacrosanct and fundamental to the mission and values of higher learning today and not inconsistent with the modern reforms and new pressures faced by the academic community.

Nevertheless, and arguably, in recent years higher education systems have experienced a surge in pressure to move away from some more traditional academic pursuits such as those of the humanities in favour of the more vocationally perceived fields of applied sciences, practical study programmes and technologies. In part, this has been driven by demands of the labour market and often in turn mirrored by a push from policy makers and the public funding of universities.

This trend has, however, begun to wane and there is an increasing appreciation that subject or field knowledge and competencies need to be balanced by a wider appreciation of the world we live in. Such an appreciation and understanding is afforded by the Humanities – in all of the field's domains as it cements the inter-disciplinarity of cognitive intelligence with emotional and cultural intelligence.

The United Nations Sustainable Development Goals (SDGs) demand an interdisciplinary approach to critically inclusive solutions. The natural sciences, the social sciences, and technological and engineering fields cannot work in isolation and must work in concert with the Humanities to ensure that science and technology and STEM (Science, Technology, Engineering and Mathematics) teaching, learning and research are balanced by a humanism that encapsulates what these fields aim to achieve. While the STEM focus is increasingly being expanded to embrace a wider STEAM approach (where 'A' refers to the Arts), there is now a further move to project this to ESTEAM, with the 'E' referring to Ethics. This is not insignificant and speaks to the holistic mission of academia. Have we come full circle? Arguably this represents a return to an appreciation that higher learning is and always has been holistic and a space for preparing learners to be fully rounded individuals rather than pure specialists.

The so-called 'Liberal Arts' education has had little traction outside of the US. In many parts of the world there is no such concept where the doctrine of specific academic fields of study and research still prevail. This is however beginning to change. Employers and academia now recognize that the world needs inter-disciplinarians. Individuals who can relate to people; graduates of higher education who can relate to graduates from fields of expertise and knowledge outside of their own narrow fields.

Realizing the SDGs precisely demands this approach. UNESCO applauds the GUNI network for promoting this inclusive approach. This 7th edition of the Higher Education in the World Series: *Generating Synergies between Science, Technology and Humanities* provides testament to the inter-disciplinary cooperation between disciplines, between higher education institutions, and between international systems as they approach the final decade of the Education 2030 Agenda.

Peter J. Wells
Chief, Higher Education
UNESCO

Catalan Association of Public Universities' (ACUP) Introduction

Since their origins, universities have been concerned about global affairs. We have been so by advancing and transmitting knowledge, and by educating the people and professionals in our societies, and by doing so in a critical and analytically rigorous manner, often by raising the right questions rather than settling for easy answers that often fail to drive us forward.

The Catalan universities that belong to the Catalan Association of Public Universities (ACUP) have both historically and currently assumed such commitment to society, both locally and globally. Created in 2002, the ACUP groups the universities of Barcelona (UB), Autònoma de Barcelona (UAB), Politècnica de Catalunya (UPC), Pompeu Fabra (UPF), Girona (UdG), Lleida (UdL), Rovira i Virgili (URV) and Oberta de Catalunya (UOC). Its main purpose is to be the essential voice of the public universities in Catalonia and to unite their efforts, both at home and abroad, to promote joint initiatives, programmes and projects to improve the university system and to ensure that it is a driver of social, cultural, technological and economic development.

Since 2014, the ACUP has assumed the presidency and the secretariat of the Global University Network for Innovation (GUNi) and works in close collaboration with UNESCO and in accordance with the values that foster peace, justice, culture and education around the world. Today, GUNi groups more than 220 university institutions, UNESCO chairs and research centres worldwide and over the years it has grown into one of the most prestigious international networks for the analysis and debate of higher education in the world. It is the ACUP's honour to chair and promote GUNi, and in our daily work we take full responsibility for maintaining its rigor, its goals and its programmes.

As you know, one of GUNi's flagship projects is the biennial publication of the series of *Higher Education in the World Reports (HEIW)*, the seventh volume of which is in your hands now. On this occasion, we opted for an in-depth analysis of a fundamental aspect of human knowledge, namely, what we know as the humanities in the broadest sense. Through direct contributions from 130 experts from around the world, and coordinated by a local team and an international advisory board, the

HEIW7 is structured into 9 parts and 24 specific questions that study the situation of the humanities in higher education and the synergies between science, technology and humanities in the early 21st century. I would like to use this short introduction to most sincerely thank all of them for their contributions and for all their work over these two years.

We are not only convinced that the humanities are subjects that need to be preserved and/or promoted, but moreover that they are fundamental tools that should accompany and be embedded in all research and innovation in more scientific and technological branches of knowledge. The humanities are and have proved to be essential for human progress, and for making us freer and more committed to the common good. We hence believe that both knowledge itself and the challenges we are facing in this first third of the 21st century need to be addressed in a holistic and integrated manner, and by establishing the necessary synergies between science, technology and the humanities.

There are no certainties. All we have are questions that we must all ask in order to find the right answers together. It is from such a view, whereby this is not so much a point of arrival as it is a point of departure, that we hereby share the World Report of which you are also a part.

Joan Elias
ACUP and GUNi President

About the Report

The Global University Network for Innovation (GUNi) is pleased to present the 7th Higher Education in the World Report, entitled *Humanities and Higher Education: Generating Synergies between Science, Technology and Humanities* in a fully open-access online version together with an abridged version in paper format.

The Higher Education in the World Report is a collective project and it is the result of a global and regional analysis of higher education, with a specific subject chosen for each edition. The Report reflects on the key issues and challenges faced by higher education and its institutions at the beginning of the 21st century. It is currently published in English, but some other past editions have also been published in Spanish, Chinese and Portuguese. The general objectives of the Reports are:

- To reflect on key problems and challenges that higher education and its institutions are facing today;
- To contribute to the renewal of ideas, while generating visions and promoting reflection concerning the contribution of higher education and the knowledge society;
- To provide a toolbox for researchers, policymakers and practitioners.

To date, GUNi has published seven issues plus a summary version requested by UNESCO for the World Conference on Higher Education held in Paris in 2009. 19,000 copies have been distributed in 130 countries.

For the second time in its history, the HEIW Report is fully open access. The first five editions offered 30% of their content in open access format, while access to the whole report was only available by payment. The 6th edition presented a new 100% open content version with the aim of making it available to everybody, regardless of economic reach, in line with GUNi's objectives and values. The 7th edition follows the same format and anyone interested will be able to view it in full at www.guninetwork.org.

Along with the full open content online version, GUNi is publishing an abridged version of the report in paper format, which contains a selection of the most relevant ideas from each of the authors' articles – offering a taste of the broader and more in-depth content available in the full report.

The 7th GUNi Higher Education in the World Report (HEIW7) is intended to present a comprehensive analysis of the interrelations and synergies between humanities, science and technology in higher education. This edition has been led by the GUNi Secretariat, a local editorial team and an international advisory board.

In the process of producing this Report, GUNi held the International Conference “*Humanities and Higher Education: Generating Synergies between Science, Technology and Humanities*” at the CosmoCaixa Science Museum in Barcelona on November 19th and 20th, 2018. The Conference was viewed as an essential step in the process of developing the report and its main objective was to foster worldwide debate on the current role of humanities in the social, academic and scientific areas and on their importance for promoting a more equitable, more responsible and more democratic society. The event gathered 160 attendees from 22 countries from diverse areas of knowledge and fields. Further information is available at: www.guninetwork.org/activity/international-conference-humanities-and-higher-education

Objectives

The Report aims to provide the academic community, policymakers and decision-makers within higher education and wider society with a comprehensive analysis of the interrelations between humanities, science and technology in higher education, as well as to offer some recommendations, guidelines and examples of good practices from different higher education communities, countries, regions and cultures.

Some of the specific aims of the Higher Education in the World Report 7 are to:

- Explore the relation between humanities, science and technology in different societies around the world and showcase examples of synergies in different higher education systems.
- Explore how humanities should address major current transformations regarding science and technology and their ethical challenges.

- Address the different roles higher education should play as a social agent and explore the possible relations between university and wider society.
- Map and understand the global challenges that are calling for a new paradigm in the relation between science, technology and humanities and explore the role that higher education should play in addressing them.
- Delve into the issue of the multiplicity of *knowledges* beyond the current Western paradigm of knowledge.
- Identify key skills and competences to be developed in the face of current changes to social, economic and labour systems, as well as exploring teaching methodologies, curricula and the concept of lifelong learning.
- Identify and understand current issues and trends in research in humanities, science and technology (socially responsible research, budgets, Open Science and Open Data) and discuss possible ways to move forward and enhance research practices and policies.
- Analyze the question of impact in terms of the current indicators and measures and their positive and negative influence on science, technology and humanities as well as proposing new options to address current practices and needs.
- Explore the issue of gender equality in terms of access to education, academic careers and the choice of studies.
- Analyze gender in science, technology and humanities in terms of ideological paradigms as well as exploring the way to embed the gender focus throughout the disciplines and beyond specific gender studies.
- Investigate environmental issues (in their broadest sense) in the Anthropocene in terms of knowledge, ethics and human experience as well as exploring the development and implementation of the SDGs in all fields of knowledge.
- Discuss engagement in its broadest scope, including democracy, equality and identity through the lens of humanities and the role of higher education in this process.
- Examine/consider the role and commitment of higher education systems in relation to the future of work, as well as its dignity and its quality.

Structure

The Report is structured around 9 topics that seek to encompass the different epistemological, social, cultural, political, educational, environmental and institutional issues that are currently being posed in relation to the need to change education and research in order to integrate fields of knowledge.

Each topic includes questions on major issues that the different authors have used as the basis for their contributions, always striving to adopt a reflective and propositional approach. Practical cases and examples of institutions, programmes, research studies and projects that work in a transdisciplinary and innovative manner are also added to illustrate the most theoretical sections.

The Report has two special chapters: one dedicated to the achievement of the SDGs and another that offers a regional perspective from Latin America and the Caribbean. Special contributions from the Union for the Mediterranean (UfM) and La Caixa Foundation are also included.

In total, 130 authors from 30 countries have participated in the report.

The Report is a key part of GUNi's activity, which in this regard encourages the dynamic involvement of a wide range of actors, fosters cooperation between them and promotes debate and the creation and exchange of knowledge on higher education worldwide.

The GUNi Secretariat would like to take this opportunity to thank everyone who was involved in the preparation and publication of this Report in any of its phases, and who have contributed ideas, suggestions and so much energy to ensure such a useful document for analysis, reflection and decision-making.

Editors' Introduction: Changes and Challenges that Require a Different Approach to the Relationship between Science, Technology and Humanities

David Bueno, Josep Casanovas, Marina Garcés, Josep M. Vilalta

Conceptual Framework

The humanities are made up of a heterogeneous set of knowledge that is combined in order to study and reflect on the human condition in social, cultural and artistic terms. Although their exact definition is complex, debatable and widely discussed, they commonly include, among others, philosophy, language, literature, history, human geography, cultural anthropology, law, politics, religion and all forms of the arts (visual, musical and performing). The belief in the West is that they originated in Classical Greece for the study of the nature of people and their position in nature and society, but they have been developed in one way or another by all human cultures and societies since antiquity, as a product of the reflexive and rational capacity of human beings and their need to understand and organise the environment in which they live. The humanities have therefore been one of the key definers of the human condition.

However, we sense a growing concern about the perception of the usefulness and need for the humanities in today's society, especially in higher education systems. This perception is conditioning their future and in recent times has sparked numerous debates, publications and reports in different countries of our cultural environment. The views on the matter are contradictory, as if there was an underlying conflict that goes beyond differences of interpretation. That is why GUNI has proposed this report, with a view to integrating all possible perspectives. Unlike other reports, however, we did not want to solely address the issue of the humanities in an endogamic manner from the humanities themselves, since we believe that such analyses would not help us to progress and would only leave us stuck in the same situation. We have expressly sought to reflect the humanities' dynamic and synergetic relationship with the other fields of knowledge, especially

science and technology, and also with a very special focus on human 'cultures', in the plural, deliberately avoiding views from centralism and cultural neo-colonialism. We believe this is the only way to gain a clear picture of the current tensions and future challenges. We believe such an analysis is necessary (or better said, indispensable) in a society that is increasingly more globalised and inter-, multi-, pluri- and trans-culturalised. Such an analysis will always be incomplete, given the immense cultural, social and, by extension, humanistic diversity, but it is nevertheless broad enough to put forward suitable proposals to help build a dignified and dignifying society from the field of higher education. The two keywords that best describe the goals of this report are diagnosis and proposal, within the aforesaid parameters of the interrelation with science and technology as elements that are also inseparable from the human condition, and avoiding the worldviews of cultural neo-colonialism. These aspects are reflected in the range of authors of this report, through their cultures and areas of expertise, while also observing gender parity.

We are aware that many of the problems that affect the humanities are not exclusive to these disciplines. Hence the need to integrate perspectives and combine our efforts and reflections in order to reappraise today's challenges in terms of research, teaching, the socialisation of knowledge and social commitment within the global university system. Our goal is for this integration of perspectives, with all the differences and discrepancies that that may imply, to be the distinguishing feature of this report, reflecting the cross-cutting nature of all the authors who have made it possible.

Concern for the current and future state of the humanities often leads to positions that shift between two extremes: the catastrophic and the protectionist views, which are often exaggerated by exclusivist positions

among certain members of academia. There are sectors of society that foresee the end of the humanities in the imminent future. Others are committed to preserving them in a protectionist way, but there are others that are working for their reappraisal and transformation. Protectionist and often nostalgic views tend to focus on defending and preserving the institutional and academic space and the epistemological division whereby the knowledge that we have traditionally considered to pertain to the humanities is considered separate from other fields of knowledge. The catastrophic vision, on the other hand, puts the focus on what is being lost and warns of its ethical, political, social and cultural consequences, which directly affect social development, including the perception of society itself, relationships with other societies and the natural environment, and even between its members and with its own self. So, the end of humanism and hence of critical spirit is directly associated to the loss of democratic quality or to a democracy under threat, and to a present in which a rise in authoritarian, dogmatic and even post-human tendencies has been detected.

This report seeks to go beyond protectionist nostalgia and catastrophism, and clearly advocates reappraisal and transformation. We see the humanities as a series of dynamic and constantly changing activities that are part of the dispute and the production of meaning in our time, in reciprocal permeability with all other fields of knowledge, including, and very especially, science and technology.

We are witnessing profound changes in the modern world with clear implications for the future. These changes are presenting transcendental challenges in terms of thinking and rethinking the meaning and value of human experience, and even of what it means to be human, as individuals and in relation to other people and with nature, now and in the future, and so we need to reflect critically and rationally, including from human emotionality. The humanities, together with the sciences and technological innovations, must necessarily play their part as both drivers and critics within the framework of these transformations. We are basically referring to three types of changes:

1. Those related with **environmental and climate issues**, which radically put into question our relationship with the environment, in a single and shared biosphere, and that therefore affect what we mean by 'life', including its development and even survival. The Western, scientific,

technological and humanist tradition, which was exported around the world during the European colonialist era, has traditionally tended to trace a very clear border between human beings and the rest of nature, based on the view that nature was 'created' for the use and enjoyment of people. The theocentrism of the Middle Ages produced anthropocentrism, but the human experience is actually closely linked to its surroundings and the reciprocal relations established therein, and this has since led to the emergence of ecocentrism. They are not the only cultural traditions to adopt that trend, but today's financial systems, not just capitalism but most especially liberalism and the neoliberalism, as well as state-based collectivist systems, have appropriated it and exported it practically all around the world.

However, the advances of recent decades in so many apparently diverse but all inter-linked fields, such as ecology, genetics, neuroscience, chemistry and physics, among others, and the growth of new philosophical and humanist schools of thought, especially but not only what are generically dubbed the 'environmental humanities', are producing a turning point in the conception of the relationship between people and nature. However, these new, heterogeneous conceptions are meeting major resistance from, on the one hand, social and cultural inertia due to customs and preconceptions and, on the other hand, the predominant political, economic and socio-cultural interests of the establishment. And also because of the biological imprint of the way the human brain works, which is more attentive to emotional inputs and responses than to rationality, making us more likely to make emotional rather than prudently calculated decisions, and which tend to be more grounded on individualistic or group immediacy and the pre-established actions of inherited customs than on long-term global reflection.

2. Those connected to the **scientific advances and technological developments** that are having such a fast-moving effect on our lives, especially but not only those raised by the implications of digital transformation and advances in biomedicine and healthcare. The first factor of change, the digital revolution, is and will be decisive in most aspects of our lives, in the short, medium and long term. Having now been assimilated as an indisputable and irreversible reality, this universal presence of highly interconnected data, processes and devices in constant feedback with each other, has only just begun and is already almost naturally ingrained in our younger generations. The repercussions in terms of

everyday operations, the way we communicate and our privacy, to mention only a few of the many factors that will all undoubtedly affect or possibly affect the very concept of human dignity and experience, are having an impact that is unpredictable at this moment in time. These issues require permanent debate, education and critical information and the adoption of measures to protect the people from the many derived threats, beyond the obvious benefits that can also be deduced.

Regarding the transformation or improvement of the living and survival conditions of human beings, partly also driven by the digital revolution, genomic research, personalised medicine and regenerative medicine, to cite just a few examples, there is need for a delicate and complex process of reflection on their scope, deployment and implications for ways of life, longevity, values, ethics and the definition of the very 'identity' of individuals, robots or cyborgs, with clear individual, social and planetary repercussions.

Finally, the connection of science and technology with the economy, and their implications for politics, the media, power mechanisms and the socialisation of knowledge itself and of new technologies, i.e. ultimately for human beings' capacity for self-determination, for democracy and for people's freedom, compels us to synergistically resituate other areas of knowledge, such as the social sciences and humanities, at the heart of discourse and decision-making.

3. Those associated with **cultural and social aspects of a global, postcolonial world**, which are highly interconnected but at the same time very fragmented and unequal. Humanism, as an ideological and cultural core of the humanities, is linked to the history of Eurocentric and patriarchal imperialism. Thus, the humanism that lies behind modern-day human sciences and political institutions is based on the way it is conceived by male, white, middle-class Europeans, and is imposed as hegemonic to every creed of human being, inside and outside of the geographic setting where it originated, and of which there have been many variants throughout the course of history in other geographic and cultural spheres. However, in recent years, academic thought has shifted towards a critical view of this hegemony, especially in countries linked to a colonial past, and this is something that we also wanted to reflect in this report. We offer a very rich and indispensable range of criticisms of humanism from the standpoints of gender, ethnicity, culture, politics, economic relations, and

more. The question that we need to ask today, however, needs to look beyond these essential positions: If humanism has become a kind of imperialism or has been exploited by imperialism, can this be stopped? And what would its 'being stopped' actually mean? Or do we have no choice but to rid ourselves completely of the whole humanist legacy as it has been conceived until now, as techno-capitalism has already started to do with its so-called 'fourth industrial revolution'?

However, we do not believe that the need for criticism of historic humanism and its universal models should erase our ability to associate ourselves with the shared background of human experience, which does not, in fact, date back to a single model. It is not a case of the Vitruvian Man or any other such abstraction, or of the cultural corpus of so-called dead white men. Human experience is our ability to share the fundamental experiences of life, which are transversal in all societies and cultures, such as death, love, friendship, commitment and collaboration and also individualism, fear, sense of dignity and justice, care, and so on. A propositional analysis like this must therefore be appraised and taken into account.

What paths do we have for exploring these proximities and developing the sense of human experience without projecting one model over another? More than being denied, humanism and European cultural legacy as a whole need to be put in their place, i.e. in one place among others in the common destiny of humanity. This also implies the need to explore each other's legacies. It is not a question of continuing with the idea of juxtaposing cultures that the multicultural model has already exhausted, as a way to neutralise diversity and its tensions and reciprocities. Instead, it is more a case of taking a receptive, attentive role, including not only cultural otherness but also the tension and antagonism between ways of life, within the shared framework of human rights.

These are not sectorial changes. They are major transformations that affect the very meaning of what we mean by 'human' in relation to society (or to societies) and the life of the planet as a whole. From these three clearly interrelated axes of change, we view the humanities not as a set of disciplines to preserve or conserve, but a set of utilitarian and applicable activities, which we must continue to cultivate through relevant research, with goals and models as necessary and appropriate for tackling new challenges. And this is in the good under-

standing that they are indispensable, for it is on them that the capacity to make sense and value out of human experience depends, especially in times of change, and this needs to be done in commitment to dignity, equality and the reciprocity of these values.

It is from this propositional approach, which is so attentive to our present and the challenges of the future, that we sought to engender diagnosis, debate and proposals that, far from conformism and catastrophism, or from nostalgic protectionism, addresses in terms of higher education the problems involved in the perception, transmission and application of current and medium-term research in the humanities. In producing this report, we have prioritised a problem-based approach over what might be deemed a thematic approach, because we believe that we can only move forward by addressing unresolved problems that we must take on board as shared problems. The main topics detailed below in this Introduction constitute a map of open-ended questions and problems on the basis of which we triggered the process of joint reflection that led to the production of the GUNi Report and that guided the organisation of its international conference and other work seminars. The fundamental aspects of the 7th GUNi Report *Humanities and Higher Education: Synergies between Science, Technology and Humanities* originated from open discussion of the following four core areas: epistemological, philosophical and cultural; political and economic; environmental and social, and educational and institutional.

1. Epistemological, Cultural and Philosophical Considerations

We are the heirs of a dualised and disciplined culture. Over the course of the last two centuries, probably driven by the particularities and specificities of the methods and objectives of scientific research and technological and humanistic development, we have split ‘scientific and technological’ activity apart from ‘humanistic’ activity, and we have organised education on the strict basis of this partition. For decades, several authors (C.P. Snow, I. Prigogine, I. Stengers, E.O. Wilson, F. Fernández Buey, etc.) have warned of the problems derived from this epistemological situation. Its effects are felt in all fields, as the humanities and the sciences tend to ignore (and

sometimes even reject) each other, and are consequently impoverished. If we want to make advances in an epistemology based on common problems and shared solutions in which all angles of human knowledge are involved, as opposed to disciplinary compartmentalisation, the first thing we need to address and discuss is the curricular and disciplinary organisation of our primary, secondary and higher education institutions. Different programmes for educational change are already under way, but they tend to focus more on didactic methodologies than on epistemological change, which is a more profound and hence also more complex affair. It is very hard to imagine an integrated university system, where problems are tackled from different practices and languages, if our starting point is a kind of education in which children’s familiarity with different types of language ends before the age of sixteen. When the general social perception is that the humanities ‘are of no use for anything’ or that the sciences are ‘too technical’ and ‘have no concern for society’s problems’, or that the arts imagined in their broad sense (visual, musical and performing) are ‘mere entertainment’, these are the symptoms of a division that neutralises every area of knowledge and produces highly restricted perspectives of their potential.

That is why we believe that treating the humanities in relation to science and technology means, first of all, imagining other configurations of the relationships between fields of knowledge. It is not a case of linking them as separate realities, but one of precisely questioning their strict Cartesian separation, and of working specifically to reverse the process from the foundations. This implies going beyond the paradigm of inter- and trans-disciplinarity. We believe that what we need to do today is not only to cross or join disciplines, but also redefine their separation. In other words, we must redraw the knowledge map, not to mix areas, but to allow and facilitate their indispensable synergies, and encourage them to flourish. Western culture has traditionally represented knowledge as a tree, with a trunk and different branches. We now have a set of branches that have difficulty meeting and speaking, or that simply do not know how to do so. What we need is a knowledge ecosystem where the connections between languages and knowledge, and between the questions and practices of knowledge, are living and dynamic, respectful and cooperative, without depending on new branches that only reach in a single direction.

This epistemological challenge, namely to turn academic disciplines into a living ecosystem of knowledge

without them losing their functional and research specificities, has many concrete implications, of which we have highlighted and presented for discussion the following: 1) Redefinition of the vision, mission and goals of the respective institutions; 2) Comparative work based on existing models or that are undergoing experimentation in different countries or sociocultural environments, and 3) Overcoming the obstacle of the specialisation and sectorisation of 'scientific-technological' and 'humanistic-artistic' languages in order to conceive collective, reciprocal work processes.

As regards the cultural sphere, the humanities have traditionally been associated to the typical cultural expressions and languages of Western societies. It is from this hegemony that the academic and cultural ways of the rest of the world are viewed, even including other Western languages and cultures that for reasons of history have not benefitted from state protection. Given the way things have gone over the last three centuries, what we call the humanities are actually strongly conditioned by the idea of 'national culture' (in the fields of literature, history, languages, and so on) and by the ethnicist view of 'other' cultures that came about in the colonial era, and even more so in postcolonial times, and which still exerts a strong influence today. The same goes for science and technology, for the branches that currently dominate research, funding and production in the global world are also derived from the scientific and technological revolution of Western modernity.

Thoughts about the challenges faced by the humanities in relation to science and technology should not perpetuate these cultural frameworks and their effects on identity or in social terms. A knowledge ecosystem for the 21st century must be produced and developed from respect, listening, equality and reciprocity between the different cultures of the world and from the different ways of life therein, in accordance with human rights. This implies two premises: 1) incorporation of the different views of what we mean by 'human' and the environment in which life is developed, and 2) assumption that cultures no longer live in isolation or at a distance from one another but are in constant interaction, hybridisation and transformation, but not always on equal terms.

From higher education systems, these premises have consequences that must be taken into account. First of all, we believe that academic institutions must not only report on these conditions but should also incorporate

them in their ways of learning, teaching, researching and transmitting a humanistic approach to our cultural, scientific and technical experience. This means going beyond the cataloguing of cultures that 'cultural studies' have somehow perpetuated, towards truly intercultural or transcultural approaches and aspiring to dialogue for change.

Finally, with regard to philosophy, what we call the humanities are not separable from humanism, as a philosophical way of understanding the world and our place in the universe. Indeed, humanism, both from its more scientific and from its humanistic and artistic angles, puts forward an anthropocentric idea of the human condition that is currently being questioned from many areas of knowledge and our present experience, which has led to the need to reappraise the definition of the humanities and, with that, perhaps also its goals and methods.

The current limits of humanism can be situated around four core matters: 1) the planetary condition of the main challenges of our time, which make us as part of a much bigger life story, with an ecocentric root; 2) the patriarchal model of humanism, which has neglected many ways of life, worldviews and non-patriarchal interrelations; 3) the religious background of humanism, which despite the shift towards secularity is still grounded on eminently Christian values, and 4) the evolution of science and technology from the sixteenth century to the present, which has changed our relationship with the universe, space, time, matter and other living beings, and even with reality itself and our perception of it, including diversity and its preservation as a fundamental right and necessity.

The humanities are nothing in themselves if we do not put their different activities and ways of teaching and learning in relation to the current limits of the humanist tradition and their future challenges. Right now, the strongest philosophical, aesthetic, technological and other schools of thought have made a stand either for or against humanism. Hence the debates on Trans-humanism, Post-humanism, Anti-humanism, and so on, which are not scholastic debates but rather positions that are establishing how a large part of scientific research, technological innovation and ways of organising life and work are going to happen in the immediate future.

Higher education must find ways to gather and trigger these discussions in the field of teaching and scientific research, beyond its circles of specialists. It is not just about having knowledge of them, but also of being able

to spark discussion on the ethical, social and political consequences of these issues in academic spheres, together with their legal, scientific, technical and economic implications.

From here many perspectives that until very recently were not taken into account are opened up. For instance, feminism and gender studies have now for decades been producing and contributing essential work for repairing the damage caused by humanistic patriarchy with regard to our ideas of the human condition and relationships between us. However, gender studies are often classed as one specialisation among many that do not affect our view on knowledge in general and the way it works. We believe that one of the challenges for the humanities, science and technology as a whole is to include the gender question outside of its specific realm, and even beyond the duality of what have traditionally been viewed as 'male' and 'female'.

On the other hand, the humanities in general and philosophy in particular must acquire the capacity and also the will to welcome the advances that science and its present methods can contribute, for example through knowledge of the way the brain works with regard to such topics as ethics, empathy, tribalism and others. Other technological issues such as robotics and artificial intelligence, or increased human capacities, condition and must be reflected in the future of philosophy and humanistic thinking.

2. Political and Economic Considerations

The political systems of each country, the legacy of their own traditions or born out of revolution, are a fundamental element when it comes to evaluating the state of the humanities in their education systems. To a large extent, laws on education and in the field of culture condition the day-to-day work of teachers, creators and researchers. It is not just a problem of public funding, but also one of orientation and goals, and of political priorities and institutional appraisal, which could range from curricular affairs to aspects of operations and promotion.

A fundamental question we need to ask is what kind of culture does each country want in the global context, on the understanding that the response and the way this is done will depend on social, political and economic development, and consequently also the individual

development of its members, including those related to other cultural, political and economic models, and with the natural environment. Thus, for example, during the formation of nation-states, to a large extent the humanities served a major role in forging their corresponding 'nations' (speaking a common language that was not necessarily shared initially, the establishment of a cultural corpus and of historical references that were not necessarily shared at first either, and so on), through, or by means of, a certain identity, which in many cases is still being promoted in our present era. In the struggle between democracy and dictatorships of the 20th century, to cite another example, the humanities also played a role in creating more democratic (critical, thoughtful and willing to enter dialogue) or otherwise more obedient (dogmatic) subjects. This role is also still very much apparent today. It was also evident in the tension between communism and capitalism, which was played out as a major cultural battle. And it is also the case with the current clash between the liberal and social economy, the unlimited spending of resources and sustainability, homogenising or integrating globalisation, and so on.

Right now, in political and economic terms (but in interaction with the environment, education, etc.), we are faced by a global scenario that in our opinion involves three major issues: 1) the birth or return of authoritarianism, in old and new forms; 2) the multifaceted and widespread nature of war, and 3) the climate emergency as a factor that is questioning the world's entire financial and production system. All this, moreover, is shrouded by the growing difficulty to distinguish between truthful and proven information (always with an element of subjectivity depending on who is transmitting this information, but that is nonetheless essentially verifiable) and 'fake news', which so quickly spreads across global social networks. What place and what role do the humanities have in relation to science and technology in this context? Some laws on education and culture only seem to attribute them a testimonial and apparently ever-more residual role. Others, however, treat the humanities as a corrector or firewall against the evil that is so irretrievably caused from other sectors and practices. In this report, we go beyond these two opposing extremes, for we are working from the idea that humanities are neither a residual heritage that needs to be protected, nor a drug or a remedy to counter the devastating effects of other areas of society. Quite the contrary, the humanities are part of making sense of

human existence and our shared experience and, therefore, of the political and social lives of contemporary societies, within them, between them and in their relationship with the natural environment.

That is why we need to ask where we should place the relationship between current political systems and their interest in or rejection of the humanities. What are the reasons for that? And how do they relate to the academic goals of scientific-technological progress? What do they depend on today? There is a certain preconceived idea that the most authoritarian regimes are the least interested in the humanities. But that is a misguided view. We need only think about Nazism, for example, and its use of culture to rebuild the Aryan identity and push its ideas about society. It is not so much a question of "humanities yes or no", but more of the way they are put into practice, how they are produced, developed and shared, and by which criteria and for what purposes. So, it is very important to assess the cultural and political perspectives, as well the institutional dynamics of the humanities or they could be used for highly elitist and non-democratic motives, which rather than facilitating dialogue and reflection promote credulity and submission.

One of the many aspects to be taken into account in the cultural development and advancement of societies is the socialisation of knowledge at all levels: humanistic, artistic, scientific and technological. It is not easy for the members of a society to have a say in equal rights or be able to make decisions that affect the whole, such as, for example, those related to reducing the impact of climate change or which have to do with ethical issues, such as the use of big data or the application of genetic biomedicine, if they do not understand the basic scientific and technological facts and their humanist connotations, or at least have access to the right kind of knowledge, to assess for themselves the implications and consequences. Most advances in all fields of humanistic and scientific knowledge happen within academic institutions or through people who are directly linked to them, in the same way that art tends to move in certain cultural circles and technological progress is the main driver of industry. In the former case, for example, scientific advances are also communicated via academia, which has very well-established rules to guarantee the originality and reliability of those advances, including the use of technical language that avoids ambiguities but is also unfamiliar to anyone who is not a specialist in that particular field. What is more, use of these communication channels has traditionally

been limited almost exclusively to the members of academia, given their highly technical nature and the fact they must be paid for.

We therefore consider that there are two very important processes of change that need to be taken into account, and that are addressed in this report. The first is the fundamental role, in our opinion, of scientific, humanistic, artistic and technological divulgation and dissemination. The word 'divulgation' comes from the Latin *divulgare*, literally meaning "deliver to the public" (being made up of the prefix *di* followed by *vulgāre*), and involves providing a certain order of knowledge to a broader audience, which implies that this must be done using the linguistic standards and basic knowledge of that audience. Divulgation therefore reduces the distance between academic knowledge made by and for academics and the kind of knowledge possessed by the general public, which for us implies the essential need to socialise the knowledge that the members of society need in order to become implicated in equal rights and be able to make the decisions that affect them. In other words, we perceive that the dissemination of knowledge and advances in humanities, arts, science and technology is a necessary activity not only for the socialisation of knowledge but also, or as a consequence thereof, to foster democratic mechanisms and the democratisation of collective decisions, by incorporating all of society, or all the members that by their own free will wish to play a part in decision-making processes with equal rights and responsibilities. For this same reason we also speak, as a synonym for divulgation, of the dissemination of knowledge, in analogical reference to the way seeds are disseminated to germinate and bear fruit. So we could also speak of 'intellectual pollination'. Indeed, many of the most influential and well-known texts of the humanities were published by their authors in a non-academic, informative manner. And in the case of scientific and technological dissemination, the means used necessarily require the involvement of the humanities in the widest possible sense, since they are based on reading, writing, speaking, audiovisual media and other such processes.

The second process of change that we feel should be highlighted is the method for academic communication of findings, which is shifting from a closed system that due to the high costs can almost only be accessed by the members of academia, to an Open Science model, whereby findings in any field of knowledge, including publications, data, software, and so forth, and their

dissemination are accessible at all levels of amateur or professional research, at no cost to the receiver. This therefore fosters transparent and accessible knowledge that is shared and developed through collaborative networks. Open Science can therefore be viewed as the socialisation and democratisation of traditional academic publications, and is a necessary process given the growing social demand for access to knowledge.

However, the consolidation of the social and cultural methods of knowledge dissemination and the Open Science model fundamentally depend on the political and economic priorities of each country in an otherwise globalised world, where laws on education, culture and the promotion of R&D can be highly influential. So, cultural policies that encourage the dissemination and transparency of knowledge and education laws that prioritise reflective and 'discussive' elements at all levels of education will tend to promote a greater say and democratisation among all members of that society.

Open Science is not, therefore, an option, but a necessity. As a practical or moral concept, the sharing of knowledge and instruments in order to benefit the progress of knowledge that forms part of humanity should be an 'obligation'. An important first change involves the extension of what we call Open Data. Although there are still obstacles and difficulties, progress is slowly being made in some areas of both public administration and the world of research, and it means taking on the commitment to make the huge amount of data that is generated available to everyone at all times. The aim is to share the data obtained or generated from any source, such as that produced in the fields of research or that is derived from different public administrations and agencies that gather information. This would be the case, for instance, with data on the weather, traffic, pollution, finance, health, sports, and so on, which may be generated by sensors, by what is becoming known such as the Internet of Things (IoT), or by our own mobile phones and data repositories when properly enabled and protected.

In addition to being a major contributor to the development of new studies based on real and proven data, this approach compels us to think in depth about concepts related to the privacy and security of data and its public and private use. This requires the deployment of regulations and a solid, disruptive (and also ethical and social) political stance. Although it may appear conceptually simple, the management of 'living' data is a major

technological and organisational challenge. The idea is for each repository of data on any given topic or experiment to be preserved and for the public to be able to access the most recent and enriched version together with successive contributions made by every new study, while safeguarding authorship and the traceability of versions over time. This is one of the main problems with Open Science. Data is hard to come by and costly in resources and time, and it is also hard to share, while the duplicity of transformed data generates much confusion.

Open Science therefore needs a firm and consistent political and social positioning. On the one hand, we must establish the ideological, operational and ethical standards for collaboration in and sharing of knowledge at the global level. We also need to think about how this is feasible in a society that has established mechanisms for the protection of intellectual and industrial property that carry considerable legal weight and where knowledge is such a fundamental strategic and economic factor for innovative companies and projects. In this context, the private sector tends to be highly reluctant to share its most strategic or profitable knowledge, which is why there has been so little progress in this area. Without large-scale involvement of humanistic thought in this major transformation, it will not be possible to lay the foundations any further than what public institutions, such as universities and research centres, are morally obligated to do at present.

Another example of integration is the Horizon 2020 (H2020) programme promoted by the European Union, which focuses on three core areas: 1) scientific excellence, not only in basic research but also in exchange projects; 2) business leadership of small, medium and large companies, with predominance of ICTs, and 3) the social challenges that are also linked directly to the humanities, which include, among others, health, demographic change, wellbeing, food safety and agricultural, marine, environmental and energy sustainability, and the promotion of reflective, inclusive and innovative societies.

In short, any approach to the humanities that relates to its social value and its transformative effects on the freedom and dignity of people everywhere on the planet, with all their conflicts and diversity, must be viewed as a political approach. From the perspective of interdependence, this approach also includes the relationship with non-human beings. Humanities help

us not to fall into the trap of 'solutionism', immediacy and technicality, and provide an idea of the roadmap, analytical density and various assessment criteria. This makes the humanities not only an arena for resistance but a common, critical and diverse front, from which to put into question and at the same time to work together to address the main political challenges of our time.

With regard to economic issues, in any debate or analysis of the humanities, the issue of funding is almost always a central one. Who should finance their transmission, development, availability, activities, resources, and so on? The public system for funding the humanities and culture has been developed in the most prosperous Western societies over the course of the last century through the public education system and a cultural system based on museums, libraries, academies, auditoriums and so forth, as well as through the promotion of the activities associated to them (publishing, artistic production, exhibitions, subsidies, etc.), although there are other ideologies of a more neoliberal nature, where it is felt that at least some cultural manifestations should be self-sustaining.

There are many questions to ask on this matter, all of them necessary, but also difficult to answer, if the aim is to recover the value of the humanities and research on humanistic matters for human experience, and also in relation to advances in science and technology. For example, when it is commonly said that the humanities are not profitable enough, what is really being said? What exactly is this referring to? For whom and in terms of what parameters of profitability? Are there other parameters? Are there other economic models for the promotion of the humanities? Indeed, there is a current of authors (among them the philosophers Martha Nussbaum and Nuccio Ordine) who have prioritised the defence of the non-profitable or useless nature of humanistic knowledge. However, how far can this duality between what is 'profitable' and what is not be maintained in mercantile terms? By comparison, how much science is profitable and in which of its aspects? This is also a highly controversial aspect in terms of the basic scientific research that is mainly done at public centres with public funding. Who should finance that? In many economic and political systems, science is very much funded through public resources, on the understanding that at least some aspects of that research may be applicable in the future. In other systems, much of the basic scientific research is funded through public or private foundations that are financially supported

by private donations. In all cases, however, in order to be granted funding, applicants are asked to reflect on possible future applications and also, and this is a very important aspect, on the socialisation of this knowledge, through dissemination, and how it might end up having a favourable affect in one way or another on social development. In the context of the humanities, do we therefore need to redefine the concept of 'profit'? Indeed, do the humanities compel us to reconsider the very concept of value? What economies and ways of life can sustain the humanistic activities that really do form part of our lives today and of the problems that we need to ponder and develop in a sustained manner?

Based on all this, we believe that considering the humanities 'unprofitable' means having a highly limited perspective of the bonds between universities and the socio-economic system that surrounds them and finances them, and reflects a Cartesian system that is excluding in the way that it classifies scientific-technological and humanistic aspects. If the humanities are to be part of the fabric of higher education and interact dynamically and synergistically with other fields of knowledge, the concept of profitability takes on a new dimension.

If these ideas stem from a negative assessment of the potential employability of humanities graduates, perhaps we should think about the kinds of jobs that will subsist (or appear as new) in the future, which will undoubtedly be very different to our present world. In a scenario where most mechanical or routine activities will be performed by organised consortia of smart machines and devices, with autonomous learning capacities and in constant activity, we might need to start thinking about 'other' types of work that will necessarily have to incorporate aspects that are more inherent to people and their feelings, thoughts and vital attitudes. The interdisciplinary component of potential workplaces will play a central role in the humanities, which will lend meaning and content to many new kinds of activities, both professional and those focused on culture and leisure, all of them necessary for a dignified and dignifying life.

The path ahead is long and difficult. If companies' success is only judged by their position in the market, their profits and their shareholders' dividends, without considering, or sufficiently considering, the plenitude of human life, this change in our perception of utility will be harder to achieve. Higher Education Institutions also have a role to play in debating all imaginable and

evaluable scenarios and the ways in which mentalities, indicators and social, labour and financial systems can be changed.

When job insecurity and low wages are common features not only of most 'countercultural' activities, but also of academic and institutional life, and not only in the field of humanities, what can we expect from our lives and work? What can they contribute and what can they give? What material and labour demands are related today with a better course for humanistic activities in general, and scientific and cultural ones too?

The change may perhaps be brought about by assuming different values, especially among young people, the drivers of change and transformation, beyond commercial success and entrepreneurship, for example, which have been so highly appraised over the last 30 or 40 years and which will have long-lasting effects. The low-cost model does not lead to more efficient and balanced societies, but rather quite the contrary. Nor does disregard for life in the fields and agricultural work, or the view of the countryside almost exclusively as a place of leisure, like a kind of theme park, or the overestimation of urban conurbations, which do not lead to more efficient and balanced societies either. If we think that many activities will be automated, and very much so, in the immediate future, it is obvious that the resulting jobs will have to incorporate other skills and abilities, and these include those linked to and driven by study of the humanities.

Universities, and particularly public universities, in many countries of the world are suffering from budgetary cuts and regulation by different international, national, regional and local administrations, often based on various profitability indicators such as those mentioned in previous paragraphs. This relative decrease in investment, which has been especially harsh over the last few years has, among other things, cheapened the academic careers of young teachers and research personnel, and led to more unstable jobs. At the same time, universities, which should be the ideological drivers of change and transformation, have often become highly conservative in their attitudes and mechanisms. They have not reacted properly and failed to envisage the urgent need for the permanent presence on their institutions and governing bodies of younger blood with a more creative outlook, who tirelessly question the establishment to which they are exposed and are continuously critical of their environment. There can be no

doubting that universities require such freshness if they are to be truly faithful to their mission to society. The excessively regulated, bureaucratic, hierarchical and result-focused vision of university institutions is becoming increasingly apparent.

So, in this Report we also want to reflect upon and make proposals about the added value of people with humanistic training supporting scientific and technological endeavours, both in academia and in the business world. And, reciprocally, the added value that scientists and technologists can contribute to humanistic development. As is recognised in the report *Work for a Brighter Future*, published in 2019 by the International Labour Organization the main jobs that will exist in two decades from now do not even exist yet, and some of the skills that will be most in demand are related to the humanities, communication, relations and critical thinking.

3. Social and Environmental Considerations

The way in which the humanities are taught, shared and disseminated has much to do with the cultural idiosyncrasy of each society, including religious factors, with their history and with the relationships they establish and have established with other peoples, with their types of economy, with the environmental needs around them, and also with any possible social and gender inequalities, both locally and globally. Access to culture or cultures in general has always been a factor of social exclusion or inclusion and of the way societies are shaped, including the relationships between their members (equality, hierarchy, exclusion in certain areas, and so on). But beyond this, the different relationships that can be established when it comes to critical tools and individual and collective autonomy are the main elements that contribute to a fairer and more egalitarian society. We are in a world and in societies where inequalities have always existed on every level, meaning sociocultural, economic, gender inequalities, and so forth.

Studies on sociology, cultural anthropology and family relationships carried out in various human groups to analyse migration and migration paths, as well as mobility among families due to marriage, indicate that social and gender differences substantially increased from the Palaeolithic to the Neolithic Ages, due to ownership of land and all it contained. This process also included

people as property, as in slavery, feudal societies and even patriarchy over women, which have featured in many cultures throughout history. Although some of these inequalities have gradually been quelled, as in the case of the abolition of slavery, the path towards gender equality and different family units, universal education and healthcare and so on, the fact is that there is still major variability between cultures and different political and social systems, and this has become especially apparent in terms of access to information and globalisation. However, such globalisation fosters other types of inequalities, not only between people in the same territory but also between territories, which can lead to neo-colonial situations. And given how easily it can be distributed, information (which can also generate 'fake news') can also help to boost or hinder the processes of achieving equalities.

Despite all this, or perhaps due to all this, there is also the perception of new and growing inequalities, such as new and old forms of illiteracy (humanistic illiteracy, scientific illiteracy, technological illiteracy, digital illiteracy), which can increase the social vulnerability of certain schoolchildren. Likewise, the mobility of global populations, through massive and rapid migrations, and which is often the result of those inequalities, but which far from solving them instead often increases them, often makes this situation even more linguistically, culturally, socially, politically and legally complex. If the humanities are about the way we shape and make sense of the human experience in terms of dignity, both individually and most especially in a collective sense, then it is essential for them to include an assessment of the current conditions for equality.

In this regard, it is important and urgent to analyse examples of the contributions of the humanities to equality in different cultural, social and political contexts, and their implementation in higher education, which will help to generate environmental conditions that are more prone towards equality, and that help to reduce these new forms of illiteracy and their impact on people's vulnerability. There is also a need for the humanities to analyse the very concept of 'equality', to prevent it from becoming contradictory to our commitment to diversity and reciprocity between cultures and ways of life. We also need to analyse the extent to which technology, and especially communications, can help ensure that this concept of equality does not contradict diversity or reciprocity, and make sure that it does not work in the opposite direction through, for example,

fake news. Similarly, knowledge of the scientific method as a means to acquire knowledge, which by definition excludes the concept of authority whereby one discovery or theory prevails over any others that might be contradictory, can help us on the path towards human equality and dignity, while maintaining diversity and reciprocity between cultures and ways of life.

A specific aspect is that of environmental sustainability as a source of inequalities and as a path towards dignified living. In the eighteenth century, the Industrial Revolution significantly altered the relationship between people and nature, and is viewed as the beginning of a new geological age called the Anthropocene (derived from the Greek *anthropos*, man, and *kainos*, new or recent). It is not, however, a clear threshold, since the human species has been meddling with nature since antiquity, from the Neolithic Revolution, about 10,000 years ago, and which brought about a radical change in the relationship between humans and the rest of the environment, and the beginning of an increasingly clearer contrast between what is considered natural and artificial. With the beginning of agriculture and livestock rearing in the Neolithic, the human species began to drift away from its atavistic relationships with the ecosystems of which it was a part. We ceased to be hunters and gatherers, and abandoned a way of life that had been maintained since the beginning of our existence, about 200,000 years ago as *Homo sapiens*, or more than 2 million years ago as the earliest hominids that evolved into *Homo habilis*, the ancestor of today's humans.

The Neolithic Revolution was also the start of an ever more sedentary lifestyle, one of the consequences of the major technological and cultural developments that gradually led to the Industrial Revolution and the Anthropocene, which is not a geologic period in the strictest sense (unlike the Eocene or the Pleistocene) but has borrowed the naming structure. Instead, it refers to an era when human activity has started to have massive effects worldwide. In the eighteenth century, the beginning of the Industrial Revolution coincided with what is considered the birth of Western modern philosophy through René Descartes, who proposed the problem of the validity of knowledge as the primary philosophical question and went on to be one of the key figures of the scientific revolution. His way of thinking was also the beginning of the scientific method, and also of the *Cartesian* separation between science and the humanities.

But the schism between nature and humanity dates further back to the philosophical and theological discussions that considered mankind to be superior to the rest of nature, as in Platonic and Augustinian philosophy, to mention just two influential Western traditions. In any case, there was a clear distinction between people and nature, which also generated significant differences in different cultural domains, such as between the West, East and so-called indigenous peoples, with regard to the relationship between humans and nature, and to humankind's position in the world.

Advances in various scientific disciplines such as ecology, genetics, neuroscience, chemistry and physics, among others, and new philosophical and humanistic ideas from what are generically known as environmental humanities, were a turning point in our conception of the relationship between people and nature, albeit against strong resistance from the prevailing political, economic and socio-cultural preconceptions and interests. Environmental humanities are an interdisciplinary area of research and reflection that addresses contemporary environmental challenges in a historical, philosophical, cultural and social manner, including scientific and technological aspects, challenges and inputs. It involves dynamically integrating the sources and development of environmental challenges, the most significant of which is climate change derived from global warming and waste accumulation, which has crucial social, financial and political repercussions, for example with regard to the availability of such basic resources as drinking water and food, and the increase in extreme weather events such as catastrophic floods and droughts. This is together, of course, with the different philosophical views derived from the different cultures all around the Earth.

In this context, the environmental humanities are characterised by a connectivity ontology based on the need to integrate human development into ecosystems. Or, put another way, to adopt ecological, economic and social sustainability as a paradigm for development, which implies treating humanity as part of a much larger vital system, the biosphere. Such a system was proposed in 1969 by James Lovelock (although he did not publish his work until 1979) as the Gaia Hypothesis, which postulates that climate, life and the geological substrate act together in such a dynamic, interactive manner that they self-regulate and create balance. According to this hypothesis, the Earth is a complex organism made up of the biosphere, the oceans,

the atmosphere and the geological substrate, which together form a cybernetic retroactive system through which the conditions for life are relatively constant via the control exerted by its own elements. Put another way, Gaia is a homeostatic system that tends to maintain its internal balance and stability.

It is not the only case in which a scientific advance has opened up a new field in humanistic research. One of the most paradigmatic was the publication of the theory of evolution by means of natural selection by Charles Darwin (*The Origin of the Species*, 1859), which was followed by another influential text for both the sciences and the humanities: *The Descent of Man* (1871).

The Gaia Hypothesis, which includes humans and all their activities as part of the homeostatic system and has profound humanistic implications, is based on several scientific principles, such as thermodynamics and the theory of complex systems, which are theoretically grounded in physics, chemistry and theories of information and ecology, among others. Although many of the postulates of the Gaia Hypothesis have been demonstrated empirically, many are deemed improvable by the scientific method, which is why it still called a Hypothesis and not a Theory (according to the current formulation of the scientific method, a 'hypothesis' is an acceptable proposal made by collecting information and data, and although not fully confirmed, serves as a tentative response to a science-based question, while a 'theory' is a model of reality used to rationalise, explain and predict phenomena, which needs to be verified by experimentation or observation).

Nonetheless, the integrated and interdependent vision that the Gaia Hypothesis offers for life, nature and humanity encompasses not only the various fields of science but also the humanities, which restores the humanities as an inseparable part, now and in the future, of human progress. For example, research in ecology has demonstrated the existence of many phenomena of symbiosis, a type of ecological relationship whereby organisms of different species collaborate for mutual benefit, and without which life on Earth as we know it would not be possible. In fact, in evolutionary terms, the first bacterial communities that existed more than 3,800 million years ago quickly grouped into small symbiotic ecosystems, known as stromatolites. The parallels with human societies and cultures are evident, and emphasise the need to use and foster the synergies between different branches of scientific and humanis-

tic knowledge, between different human cultures, and also between human activity and the rest of nature, as proposed by authors such as Edward Wilson, one of the founders of sociobiology. In fact, because of its humanistic implications the Gaia Hypothesis has also been worked on from philosophy by the likes of Pierre Teilhard de Chardin, Thomas Berry, Alan Marshall, Tony Bondhus, Edward Goldsmith, and others.

A derivative of this is the growing phenomenon of Smart Cities. Defined as cities equipped with mechanisms based on the technologies of the information and communication society, these are focused on improving both the management of different services and the quality of life of their inhabitants. They are not solely based on the construction and management of physical and digital infrastructures, but also on the availability and quality of communication of knowledge and social infrastructure, i.e. their intellectual, social and cultural capital. The competitiveness of Smart Cities therefore also depends on the sustainable and socially acceptable implementation of information and communication technologies, and on social and environmental capital. Sustainability and inclusiveness are fundamental components of this worldview, as is the need for the people to co-participate in decision-making. So, the necessary relation with the humanities is evident and direct, at the same time that the term Smart City is being used as a commercial slogan.

In parallel with advances in ecology, chemistry and physics, genetic research has demonstrated the single origin of life on Earth, and therefore the existence of an undeniable biological kinship among all living things, from bacteria to humans, who are all members of the same interrelated vital community. It has also been shown that what is known in evolution as the 'tree of life', which usually places the simplest organisms at the bottom and the most complex ones at the top, with humans at the highest point of all, is actually inaccurate. Despite the existence of an evolutionary relationship between all current and extinct living beings, genetic research indicates that there is no directionality in evolution, which places humanity on the same biological level as all other living beings with which we share our planet. This is a solid argument for environmental humanities, and raises important philosophical questions not only on our relationship with the rest of nature but also on humankind itself.

However, the absence of evolutionary directionality does not mean that mankind has found a new ecological niche, namely culture (in ecology, an 'ecological niche' is the place that a species occupies within the ecosystem, or, in other words, it is the function that a species performs within its ecosystem, and which is defined by such aspects as behaviour, the nutrients it consumes and where it gets them from, the effects it has on other species, and so on, and is the result of its evolutionary adaptation to the environment in which it lives). This ecological niche, in which the development and transmission of humanities, science and technology are deemed typically and exclusively human activities, arises from the ability to reason, deduce and analyse that is generated by a very specific organ, the brain. Advances in neuroscience have shown that the most distinctive and apparently exclusive characteristic of the human brain with respect that of any other organism, and despite humans having evolved out of ancestral primates, which came from other ancestral mammals and those, in turn, from the lineage of vertebrates, is the existence of neural circuits, located in the so-called frontal lobes, that are involved in the ability to visualise and plan alternative futures, to reason reflectively on the pros and cons of each of these futures, to make decisions that take this reasoning into account beyond any primary biological impulses, and to adapt individual behaviour in the right way to achieve the desired goal (what is called "control of the executive functions").

The ability to adapt behaviour to a desired goal or future very importantly includes inhibition against impulsive behaviours, which are produced as a result of emotional and previous learning experiences that condition behaviour in a reflexive, subconscious way. In terms of cerebral activity, emotions are preconceived behavioural patterns that are automatically triggered in any situation that requires an immediate response, since pondered responses are much slower and consume many more mental resources. This implies that we are not aware when emotions are generated (such as fear, anger, sadness, disgust, joy or surprise), but once they have been generated we do become aware of them and they can be redirected through the emotional control that is part of our executive functions. Emotions are, in evolutionary terms, crucial for individual survival, since they permit quick responses in situations that require them. The study of emotions and their role in human life has also been widely analysed by the humanities and art. In fact, art appeals directly to human emotions.

And as for philosophy, the subject of emotions appears in the work of many philosophers, both from Western tradition, such as Plato, Descartes, Pascal, Hobbes, Spinoza, Shaftesbury, Hutcheson, Hume, Kant, Brentano, Husserl, Scheler, Stein, Heidegger and Sartre, among many others, and also from eastern tradition. In the fourth century BC, for example, the first Chinese philosophers were distinguishing between the mind (*xin*), biological human nature (*xing*) and emotions (*qing*) to explain the origin of morality and knowledge. And the subject of emotions and emotional management is central to the Buddhist and Confucian traditions. In other words, research in neuroscience and philosophy are clear examples of the synergies that can and must be established between the humanities and science.

Research in neuroscience has also shown that, although areas of preferential activity can be identified in the brain that manage certain types of task, it functions as an integrated whole, synergistically using all the sensory data it receives together with its previous experiences, emotional responses and the capacity for reflection and reasoning. Some activities that were believed to be typical of adult brains and that needed to be specifically learned, such as the use of the scientific method and philosophical reasoning, have been shown to be consubstantial to the human species, and are used instinctively from childhood as part of the 'basic software' of being human beings. For example, 12-month-old babies have been shown, before they have learned to speak, to routinely use both disjunctive syllogisms and the scientific method (observation, deduction, experimentation, analysis, new deduction, and start over again) to relate to the environment and extract information that they find valid and can hence transform into knowledge. Going back to the Anthropocene and current environmental challenges, where is this taking us? Although Gaia tends to maintain the homeostasis of the Earth, the accumulation of waste, over-exploitation of resources and the need to produce huge amounts of energy are pushing the planet to the limits of its own capacity for recovery and regeneration. Although there is debate about where this is ultimately heading, due to the lack of scientific data with which to compare the situation, and despite the existence of pressure groups who seek to minimise or deny the effects of climatic change by confusing them with oscillating weather conditions, alterations to biogeochemical cycles are threatening to increase social and territorial inequalities, cause more extreme weather phenomena, such as prolonged droughts and

floods and other catastrophic meteorological events, and as a result raise the number and virulence of regional and global conflicts.

Scientific research must open new avenues for understanding these phenomena and offer new possibilities for managing human needs, based on its methods. Humanities, in turn, should enable and facilitate intercultural, intersocial and interterritorial dialogue, reasoned assessment of needs and the establishment of shared and achievable sustainability goals both locally and globally, which also affects the ethical aspects of the integration of human life in its environment. And technological development must feed on scientific and humanistic contributions in order to streamline the transition towards sustainable development. Everything must come together in a political, social and cultural climate that encourages the integrated functioning of human brains (i.e. people), in a sufficiently settled environment in which they can make the most appropriate and meditated individual and collective decisions. And once these decisions have been made, they must have sufficient room to adapt both individual and collective behaviour to make them possible, in a multicultural, multisocial and multiterritorial environment that is respectful of different perceptions and sensibilities, and making use of the elements that are best suited for the common good. One of the goals of this report is therefore to offer a platform for meeting and discussion between the humanities, sciences and technology so that they can contribute synergistically to the environmental challenges that human activity itself has generated in every one of its senses.

In many cultures, human beings have viewed themselves as the centre of the world and of creation, different from the rest, with the right to use and exploit the rest of nature without having to render account. In modern times, we do the same as re-creators. However, the environmental challenges require a reappraisal of the situation, given what our legacy means for future generations, for human well-being and dignity, and for life as a whole. This also means non-human intelligence. In other words, the meaning and value of humanity must be resituated, in order to integrate human life, in a balanced way, in the life of the planet as a whole. And these are issues that go further than scientific research and technological applications and are instead fully part of the field of humanities.

4. Educational and Institutional Considerations

In general, education systems in much of the modern world, especially in secondary school and higher education, have a globalised tendency to prioritise the resolute, adaptive, and competitive aspects of learning, with a growing vocational focus. This has even affected the way we work in humanities departments, adapting all knowledge and research activities to goals, methodologies and (currently digital) instruments that are often based on criteria alien to the activity's own needs. The problem-solving and critical questioning involved in humanistic activity, which seek to trigger the critical, evaluative and creative dimensions of the relationships between what we do, what we learn and what we know, are side-lined from education at too young an age.

In a relatively similar fashion, there is often a tendency in science to try to explain scientific knowledge and theories in a finalistic manner, to solve specific problems rather than employ dynamic processes involving the gradual and critical extension of knowledge, which is often obtained *per se*. And these require the application of the scientific method in some of its forms, such as experimental or the hypothetical-deductive, and of reflection, also as procedures to predict and prevent problems.

On an educational level, all learning, whether of concepts (regardless of whether these are humanistic, scientific or technological), of skills (procedural learning) or attitudes (inclusiveness, respect, critical and reflective assessment situations, dialogue-seeking to resolve conflicts, empowerment of one's own life history, etc.), is stored as memories in the brain in the form of patterns of neural connections. The brain is the organ of thought, and its activity produces mental functions and psychic faculties. Learning fuels the brain, and this conditions a person's self-image and their view of their environment, and the way they relate to it. In other words, education is the key to the future of people and societies, as the great theorists of modern pedagogy have been emphasising for decades, with specific proposals of great didactic value that promote, above all, the personal growth of students from shared, cross-cutting and dynamic experience, getting them socially implicated in a context that enriches human dignity. An education that synergistically and harmonically integrates the humanities and science through

thought, reasoning and emotions will help to generate more plural and pensive human minds.

The more neural connections a person's brain has, the richer their mental life. But that is only half of the brain-building process through education. The other half is about the areas of the brain that are prioritised when establishing new connections. An education system that prioritises the management of otherwise inevitable uncertainty and changes to the environment through fear and, by extension, credulity, is not the same as one that does so via transformative curiosity. The former, taken to the extreme, tends to generate fearful people who will shy from change, and thus be more easily manipulated by demagoguery and populism. The latter, also taken to the extreme, will lead to people with a proactive attitude who are willing to thoughtfully explore new ideas and transform themselves and their surroundings should they deem it appropriate.

These differences arise from the way knowledge is transmitted, and how it interacts with other knowledge. To put it bluntly, primary, secondary and higher education that integrates humanistic, artistic, scientific and technological knowledge in a dynamic way, not by blending them all into one but by using them all, each with their epistemological particularities, to address different issues from all possible angles, will help to build people with a greater mental capacity to integrate, value and reflect on any situation. In other words, it will make for individuals with a greater capacity to contemplate and appreciate situations by themselves based on the data around them, and become involved in the search for solutions and to commit themselves to making them happen, both individually and collectively. Primary and secondary education conducted under these conditions necessarily means the same notion should be carried across to higher education, with the incorporation of humanistic aspects in the study of science and technology and vice versa, in order to maintain and enhance this 'wide-angle' lens, but without neglecting the opportunity to 'zoom in' on any required specialisation in any particular field of study.

If education stops teaching students to think and evaluate what we do and what we know by themselves and with others, and focuses only on the zoom without a wide angle view, it is no longer education and instead becomes schooling, programming or indoctrination. We should bear in mind that the word 'education' comes from the Latin *educō*, which is formed by the prefix *ex-*

(out of, far from, in each part of, in awareness of), and *duco* (driven, guided). So, the debate on the humanities should not be about how many hours or how many departments are needed in humanistic fields, but about ways to promote a certain attitude to knowledge (or knowledges) from the very start of the education system that includes all forms of learning and allows bridges and mutually enriching relationships to be built between science, technology and the humanities.

One of the key questions we need to ask is what curricula favour this dimension of learning and how education methodologies should be focused in order to promote cross-cutting knowledge and growth. Curricula tend to focus on *what* we need to learn (the content), and at best make only a few suggestions as to *how* it should be learned (the methodology). Indeed, *what* needs to be learned is one of the most segmented aspects of academic disciplines, and there are often very few inter-relations between them (especially between science and humanities). So, another key question to ask is how the *why* can be included in curricula, i.e. *why* we should learn certain things (the *what* or the content) and *why* this has to be done in a certain way (the *how* or the methodology), given that it is precisely the *why* that is always cross-cutting and lends meaning to everything else.

Taken to specific and possibly more tangible cases, and to cite an example from that of Europe, it is essential to reflect on the effects of the deployment of the European Higher Education Area on these education conditions; on the limitations faced by teachers and students when it comes to finding an interrogative, critical and evaluative approach to what they do; on ways to assess elements that do not apparently fit easily into current indicators of education, such as intuition, peripheral thinking, cooperative problem-solving and so on, and on what effects the rankings have on the humanities. Throughout this analysis, and something that justifies the imperative need for it, there is another crucial aspect that needs to be taken into account: complex situations only find sufficiently satisfactory and efficient answers from plurality and diversity, through wide-angle analysis from which we can zoom in on the most important points, and interrelate them.

At the institutional level, there is a general feeling of the regression or residualisation of humanities departments at many universities and higher education centres around the world, as well as humanistic approaches in other areas, which are viewed as accessories or optional.

The extent to which this is the case in different countries and contexts needs to be examined, along with the consequences and also experiences that have worked in the opposite direction, like some of those included in this Report. In many countries, a shift or transfer of humanistic activities has been observed. While the humanities are leaving universities, they are spreading into other types of cultural entity or institution. Similarly, there is also an excessive mood of mercantilist technical professionalisation in the scientific and technological departments of many universities and higher education centres, which put limits on a more global vision.

One of the issues to be resolved is the assessment of multi/inter/trans-disciplinary research. In terms of academic and research policies, this kind of research is held in increasingly higher esteem at the conceptual level. Indeed, mankind's greatest advances, in any area, usually happen in the borderlands between disciplines, where the weaknesses of one become the strengths of the other, and vice versa. However, in order to apply for funding, stand for academic positions or even to justify the curriculum, the system is cordoned off into impermeable areas of knowledge that work in the opposite direction, i.e. they clearly foster monothematic specialisation above transversality. Hence the long-standing but growing tendency in the scientific and technological university world to take refuge in the 'business' of publications and research focused on success in journals and 'competitive' assessments, while paying little heed to the potential transferability of 'research' or the need to socialise knowledge. However, and perhaps to compensate for this, the competitive funding of research, for example in the specific scope of the European Union and in several other countries, has, for some years now, included a section on the potential transfer of knowledge, where any intended actions in this regard should be noted. This requirement has led all public research centres and universities to create or expand communication offices, in order to contribute to this goal. However, these tend to be highly inward-looking, and lack the required multi/inter/trans-disciplinarity. We hence believe that we need to take another look at the interrelationship between disciplines, and this matter is also analysed in this Report.

By what processes are these displacements occurring and what are the consequences? The University, as an institution, has not only chosen to prioritise certain areas of knowledge, but more importantly certain procedures, objectives and standards for the assessment

and profitability of academic activity that are often unsuited to humanistic activities, which tend to encourage specialisation activities in very specific and limited areas. What are universities winning and losing by this move? On the one hand, by acting like this, universities are pandering to the dominant discourse and the increasingly widespread perception that the public sector in general needs to be changed into a merely neutral provider of quality services to society. This is the very worst case scenario for humanistic studies.

This view, manifested in a wide variety of ways depending on each social and cultural situation and each country's policies on universities, places the concept of the "citizen that must be provided with services", and which must be as personalised as possible, right at the centre. In this process, which in our view is still happens far too incipiently, the people also must also be made to feel they are able to control and audit the way the resources that they finance with their own taxes are used. In addition, some lobbies are trying to weaken or diminish that public sector, either because they have so little confidence in its efficacy, efficiency and transparency (often justifiably) or for more short-term interests, such as prioritising certain budget items over others or transferring them to the private or mixed sector, to the benefit of the corporations they represent. This legitimate need for control drives the creation of protocols and legislation to guarantee that the procedures, expenditure and results of institutions and administrations are monitored. The increase in controls and guarantees, and the inherent difficulty of managing such a highly digitised public sector, is a challenge for administration as a whole and, in particular, universities.

An example of this perspective of change in the relations between the administration and the people is the implementation of new models and concepts for life in cities and metropolitan areas, where the most rapidly-changing concentrations of the population are located. In Smart City or Smart Metropolitan Area terms, the people are active agents of the processes of urban and social change that will supposedly lead us towards a fairer, more sustainable and more caring society. Guided by such events as those derived from United Nations 2030 Agenda, cities are building a discourse that prioritises such issues as equity, circular economics, sustainability, the environment, health, mobility and governance, among many others. Where do universities stand in this new order?

When we project this phenomenon (and many other changes, such as the new digital skills of young students and their methods for socialisation) onto university, we find that they are affected in a variety of ways. On the one hand, as a public organisation (or private, but nonetheless projected at the public), it is subject to mechanisms for the control of procedures, results and, in the public case, costs, like any other administrations and services. This implies a certain level of often bureaucratic administrative control that clashes with the academic way of doing things, where there is generally less concern about criteria of economic efficacy and efficiency. It is the scientific quality or level of what is done for society that matters most and, unfortunately a lower status is attributed to the provision of adequate, modern teaching that is connected to the needs of society and the labour market.

So, in the adaptation and connection of academic activity, especially teaching, with the specific and often circumstantial demands of the socio-economic and industrial fabric, the situation is still very difficult, and also very unclear, in many university contexts beyond the quest for the very survival of academia as an institution. Is it the socio-economic fabric that should be dictating academic activity? Where does the need for university autonomy stand here? Is it possible to satisfy all the different stakeholders: the financial, political and social, students and academics?

Along with this, there is the pressure to specialise and to forge professional profiles that are in keeping with the specific demands of the economy at any given time. A paradigmatic case is the need for computer experts with in-depth knowledge of certain tools or products that are mainly implanted in the market. These computer packages and services often have a relatively fleeting lifespan in comparison to the working careers of professionals in the sector. This phenomenon of ultra-specialisation resonates with the tendency for science and technology to head in the same direction. The movement to promote multidisciplinary has only just begun, but trans-inter-multidisciplinary activity is still too heavily penalised in the academic context, and especially the mechanisms for funding research and in the relentless universe (and business) of publications.

Education centres are responding in a variety of different ways. Some simply react by inertia or mimicry, depending on the setting and what leading education institutions are doing in their respective fields. Others

respond with the utmost immediacy, for example by creating degree courses that are very tightly bound to the needs of the labour market.

We also need to differentiate between universities in terms of their history and origin. 'Historic' universities tend to offer a wide variety of degrees in all areas of knowledge, as part of their traditional mission to teach people who, over the years or centuries, are required by a certain society. The globalisation of supply and demand, and the internationalisation and appearance of new 'markets', are gradually changing their ecosystem. They still try to meet what they believe to be their commitments, regardless of financial context and the returns, and look to balance human and economic resources in order to satisfy 'all' academic needs, as perceived by the institution itself. This means keeping and/or finding staff and degrees that are difficult to sustain in the medium term.

Meanwhile other universities, which are often privately owned, focus their portfolio of degrees on the direct needs of the market and also, let's face it, concentrate on those professions that they consider strategic, be that socially, politically or to create nuclei of power and influence. By way of example, we find universities that concentrate on or prioritise such strategic areas as law, economics, business and health sciences. This brings them closer to present and future decision-making hubs and, ultimately, to empowerment and consolidation of their influence (a possible mission of the institution itself) and to hypothetical financial returns in the future.

We cannot ignore how certain currents have been bulldozing the image of universities as the original, sole and essential source of new knowledge. There are several questions that we need to ask here. What should we make of the boom in 'business universities', especially with regard to lifelong learning? How can the mechanisms for accrediting and acknowledging skills and knowledge (which are conveniently guaranteed via blockchain procedures) be coordinated with the demand for professionals and their remuneration? How can we integrate the research done in large companies within the 'open' panorama heralded by universities? And how can we quantify and evaluate, in a guaranteed and secure manner, the effect in the present and in the immediate future of quality virtual learning that is now so widely available to different layers of the population? We are no longer merely speaking of remote or open universities, but also of the huge amount of materials

and structures that are more or less spontaneous or even supported by major universities, that can be found nowadays on the internet (Coursera, Udemy, and so on, and in such an uncontrolled and uncontrollable fashion on such social platforms as YouTube).

This reality clashes with the lives of institutions that often stand out for their contributions to knowledge and research, but are struggling to subsist and to attract the best academics and researchers and the best students. How are these institutions to remain preeminent due to having the best experts and professionals, who can only be recruited and conserved if they are provided the means to do their research projects in a reasonable, long-term manner and with the right social and emotional returns and the knowledge that they are supporting human progress? We believe that one possible answer might be based on the ability to maintain and strengthen stable, well-structured, well-funded and well-governed, multidisciplinary and multi-institutional teams that integrate different fields of knowledge and, as a result, provide a response that is better oriented towards the need to understand and improve the complex systems that make up the world today. One such alternative is being consolidated, and it revolves around a new model of self-styled 'popular' or 'free' universities that are trying to provide an answer to some of the challenges and shifts that we have been mentioning in this introduction. However, without going into their social relevance and connection with new proposals and visions, to what extent are they or can they be ratified as academic universities?

Another key question for higher education in relation to the humanities, science and technology is where all of this is going to take us and who will ultimately benefit from it? Thinking in general, much of what 'comes out' of universities has no specific projection (so it does not really 'come out' at all) basically because the actual research is not based on society's direct needs but on the intellectual intents and interests of researchers and research groups. However, there are different models that depend on corporate involvement in university research and others for governing the obtainment of economic resources. Another considerable amount of university results is channelled through instruments that are perpetually being changed and adapted, such as framework programmes or national research programmes, which depend on political management by each country or each conglomerate of countries, such as the European Union and its Framework Programmes,

which are increasingly dependent on national programmes and whose intentions are well-meaning: to foster collaboration between states in terms of research and development. Unfortunately, however, the system supposedly driving their leadership has mutated into becoming the fundamental mechanism for the survival of research groups and other related institutions.

In the specific example of the European Union, the latest trend in Horizon 2020 programmes and the future Horizon Europe entails an incessant increase in the weight of (large) companies in the constitution and credibility of consortiums and in the distribution of resources as opposed to university groups, and it is easier for more flexibly structured private organisations to justify such expenditure than it is for more compartmentalised and hard-to-govern university system. Within this framework, the humanities are at risk of being marginalised.

Finally, we should consider the question of the relationship between the humanities and the circuit of cultural industries. It still seems evident that the world of humanities is unclear about how its academic, teaching and research work forms an integral part of the value chain in the future employment world and, in particular, of the promising changes to the cultural industry. It is shocking to see people question the connection between academic activity and the 'financial world', beyond the personal brilliance of scholars in different subjects. We need to stop viewing society as something to be instructed, driven or indoctrinated and instead see it as an integral part of the cycle of knowledge creation and the training of people and, in particular, citizens.

Of the many reflections that we could make on this subject, it is clear that, in the world of the immediate future, employment will gradually become scarcer and human beings will have to fill their time with other activities that generate another type of compensation and positive feelings. Industry linked to culture (and we are not just talking about the supply of cultural content, but also the whole industry that supports it by creating physical, digital and virtual infrastructures) and industry dedicated to the identification of interests, to the generation of expectations, to media management, to management of the business model, and so forth, will be the bulk of the work done by humans. The weight of the digital, virtual, augmented reality and other such worlds will also be very important and hence the need for universities to train new people who are able to recognise and integrate the different universes involved.

The establishment of permeability mechanisms between the universe of the humanities and the people, wherever they are, from whatever starting point, will bear increasingly more important value and weight in the creation and perception of personal and collective well-being, harmony, plenitude and satisfaction among societies.

Moreover, if this connection between the two universes, the academic (the trinomial of the humanities, sciences and technologies) and the resulting economic and social reality, does not occur, the void will be filled by others: clearly the evolution of those that are already being deployed, plus a multitude of complementary or additional initiatives that will come from other business sectors, and the most restless from the world of science and technology, who will have spotted an endless number of opportunities for the production, creation, diversification and generation of beauty and wealth.

In short, how can modern-day public institutions maintain and promote their commitment to social equality and the universal availability of all knowledge for everyone? What institutional scenarios can we imagine for the immediate future? Centralisation or decentralisation of universities? Standardisation or diversification of the ways of exercising knowledge? If we take heed of the tendencies and more superficial trends and perceptions, the shift towards the centralisation of systems and processes of coordination and control will unfortunately become even stronger.

Universities are following the same path. Coordinated and centralised organisation mechanisms, especially those based on computer applications, are tending towards unification because they are cheaper from the preponderant perspective, which is that of managers. Flexibility and proximity are always more costly and difficult to control, but the key factor when articulating decentralised, close and flexible mechanisms is precisely to get them to adapt to the changes that are inexorably on the way.

The distance and disregard among the management of academia is not working in our favour. It would be a grave mistake to consider this activity inferior because, from our cross-cutting approach, all cultures and knowledge are necessary in order to survive in the university of the future. Another dimension is blooming, and how is university teaching to be organised (and hence its areas of knowledge and departments) in order to structure a flexible offer,

with a capacity for evolution and sustainability, and to transmit knowledge and connect in a certain way with society?

The current tendency to specialisation from the first year, and to the continuous creation of master's degrees in line with scientific and technological trends as they appear, does not help to build bridges, although some of these courses do pool these areas, as in the cases of bioengineering or studies that combine environmental issues with social and territorial planning.

So, throughout this context, what are the implications of the Responsible Research and Innovation (RRI) paradigm and how should it be addressed at the institutional level, especially in relation to the humanities? Many science, engineering and architecture courses, for example, have made major efforts to progressively introduce aspects related initially with ecology and then with sustainability, and more recently with values and ethics in the research and exercise of professions. Clarification of the missions and visions of universities, along with the creation of codes of ethics in different university activities, has helped to change the flat and, apparently, neutral scenario of science and work at university in general.

What would be the most appropriate science and education policies to integrate the humanities, science and technology into higher education systems nationwide, and what success stories could be used as benchmarks? What are the implications of the concepts of academic autonomy and academic freedom at universities in relation to the humanities? How are these two concepts configured in the face of the current challenges? Some universities have already included subjects, seminars and even postgraduate courses whose purpose is to bring the humanities and science/technology closer together in an interdisciplinary manner. These are good examples of the humanities being moved closer to or included in other knowledge areas of higher education, and which foster joint research in particular fields. Analysis and reflection on the kind of future we all want for society should guide us in the exploration and implementation of a higher education that, without losing the necessary specialisation, opens its horizons towards the synergies offered by different fields of knowledge. This report hopes to contribute to that.

Part 1

Worldwide Context

1. What are the global challenges that require science, technology and humanities to be integrated into a conception of research and teaching in the higher space?

Higher Education in the New Era

Federico Mayor Zaragoza

Abstract

The SDGs represent the commitment of the countries of the world, under the UN multilateral framework, to wisely guide the behavior of human beings in order to ensure equal human dignity, through a knowledge based strategy to provide them all with global, human and sustainable development (food, water, healthcare, environmental care and education). At a time when many threats to the world are potentially irreversible processes and therefore action cannot be delayed, it is only with the full exercise of the distinctive human faculties that the present trends can be readdressed: to think, to imagine, to anticipate, to innovate, to create! The promotion of philosophical and creativity capacities is essential at all levels of the education process. For the first time in history, "We, the people" means men and women and because of digital technology, they know what is happening worldwide and can express themselves freely. No more silence, no more fear, no more submission. Now, at last, they can hold the reins of common destiny, and the academic, scientific and artistic communities must be at the forefront of this new era, in which the transition from a culture of domination, imposition and war to a culture of encounter, dialogue, conciliation, alliance and peace will take place.

"Each human being unique and capable of creating, there lies our hope".

recommendations from the scientific community and a direct contribution from President Obama.

The SDG represent the commitment of all countries all around the world, under the UN multilateral framework, to wisely guide the behavior of human beings in order to ensure equal human dignity, with a knowledge-based strategy that will provide them all with global human and sustainable development (food, water, health, care for the environment and education).

It was an idea of the British Minister Richard A. Butler that led to the foundation of the United Nations Educational, Scientific and Cultural Organization, in London in November 1945. The UNESCO Constitution opens with the following words inspired by a poem by American author Archibald MacLeish: "Since wars begin in the minds of men, it is in the minds of men that the defenses of peace must be constructed." And it later underscores that "The wide diffusion of culture and the education of humanity for justice and liberty and peace are indispensable (...). Peace based exclusively upon the political and economic arrangements of governments would not be a peace which could secure the unanimous, lasting and sincere support of the peoples of the world (...). Peace must therefore be founded, if it is not to fail, upon the intellectual and moral solidarity of mankind." The Organization was determined to contribute to peace and security by promoting collaboration among nations through education, science and culture.

The United Nations Development Program (UNDP) was created to eliminate or at least reduce differences among peoples, to prevent the breeding grounds of poverty and exclusion from giving rise to actions that could affect stability and peaceful coexistence. For that purpose, development must be all-inclusive, that is, the focus should not only be on the economy, but also on society, politics, culture, education and healthcare. Development must be endogenous, it cannot be bestowed, because the capacities and skills it requires are instead acquired through daily efforts. It must be sustained and long-lasting, so as not to affect the envi-

Introductory Remarks

In December 2015, the Resolution adopted by the UN General Assembly, with the aim of Transforming our World⁽¹⁾ by means of the 2030 Agenda and the 17 Sustainable Development Goals (SDG), was a good cause for faith in our ability to tackle the global threats posed by the Anthropocene.

The resolution coincided with the Paris Agreements on Climate Change⁽²⁾ which were signed after several

1. http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

2. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

ronment or deplete natural resources. And, finally, it must be human, that is, all inhabitants of the Earth without exception must be both the beneficiaries and main actors of development⁽³⁾.

Now that so many new rules are being imposed on our education processes. Now that the main focus is on mathematics rather than philosophy, and on specific disciplines rather than activities that can trigger creativity, such as art and music. Now is the time to calmly discuss education and assert the essential importance of UNESCO's Constitution which, based on ethics and equal human dignity, proclaims that the goal of education is to create "free and responsible" people⁽⁴⁾. These are the features that Francisco Giner de los Ríos proposed almost a century ago when he defined education as the capacity to "sensibly manage one's own life". And to act according to one's own reflections and never according to the dictates of others or of anything else.

The second paragraph of Article 26 reads, "Education shall be directed to the *full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms*. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace". The Universal Declaration is especially relevant today when so many biased definitions are being put forward by institutions specialized in other areas, such as economics, which should not interfere with education to promote their own interests.

Educational processes aimed at making human beings fully capable of using their distinctive creative capacity, capable of inventing their own future⁽⁵⁾, something that should never be accepted as inevitable. Supremacism, fatalism and dogmatism must be eradicated, enabling men and women to lighten their burden and fly high in the infinite space of the spirit. For that reason a "free and responsible" education for citizenship is essential, an education that should -according to the first paragraph of the Preamble of the Universal Declaration of Human Rights- "free us from fear".

Thoughtful and committed citizens who do not allow themselves to be intimidated, who know how to overcome the fear that thwarts the free will of so many⁽⁶⁾.

UN priorities

The priorities that must be urgently addressed by the scientific, academic and artistic communities -that is, the intellectual community as a whole- on a global level (a multilateral democratic system)⁽⁷⁾ include:

- Food: food production using agriculture, aquaculture and biotechnology; preservation and suitable distribution of food, promoting as much as possible the local raising of crops and livestock.
- Water: Appropriate use and management of water resources, adequately technified agriculture, water production through desalination, etc. are essential aspects for ensuring the welfare of all inhabitants of the Earth.
- Health: This will undoubtedly become the most important field of scientific research in the next few years, given its increasing "customization". Much progress has been made but, since each life is a wonder that must be nurtured with the utmost care, in-depth studies are required in genetics, epigenetics, autoimmune symptomatology, neurological deterioration due to age... All of these are areas that deserve special attention. Prevention is undoubtedly the "top priority", but it is most difficult to find popular support for these areas because they are "invisible".
- Environment: For the first time mankind is living in an age in which human activity has a global impact. It has been called the "Anthropocene" in reference to the fact that, given the tremendous development of their creative imagination, human beings can modify parameters today that not so long ago were beyond their reach. It is in this area where specialists on energy sources, on recapturing carbon dioxide and other greenhouse gases, on forecasting the effects of the partial melting of polar icecaps, particularly in the Arctic, should focus their research in order to take steps to stop or at least reduce the present rate of environmental deterioration.

This is a requirement related with intergenerational solidarity⁽⁸⁾. Rapid and coordinated action to reduce

3. <http://www.undp.org/content/undp/es/home/sustainable-development-goals.html>

4. <http://www.un.org/en/charter-united-nations/>

5. http://fund-culturadepaz.org/eng/03/2012/ART-Invent_the_future.pdf

6. http://www.un.org/en/udhrbook/pdf/udhr_booklet_en_web.pdf

7. http://fund-culturadepaz.org/eng/03/2012/ART-The_Democratic_Multilateralism_Urgency.pdf

8. http://portal.unesco.org/en/ev.php-URL_ID=13178&URL_DO=DO_TOPIC&URL_SECTION=201.html

the impact of natural disasters (wind, water, fire,...)⁽⁹⁾ is another of the measures that the citizens of the world are demanding, when they see the huge amounts of funds devoted to military spending, while the aid needed to rehabilitate areas devastated by earthquakes or tsunamis and to get victims' lives back to normal is always too scarce and comes too late.

It is, therefore, time for action. Many diagnoses have been provided, but it is now crucial to take action before it is too late. Under those circumstances, the ethics of time⁽¹⁰⁾ should be one of the main foundations for our daily behavior on all levels, if we want to prevent what would represent genuine intergenerational and historical irresponsibility.

- Education: As is the case with health, water and food, education is a social component that allows human beings to live a life of dignity –that gives them the right to a dignified life! - and so there should be no limitations on access to education at any age, on the possibility to learn and to study to acquire an education, that is, to become capable, as already emphasized, of acting in accordance with one's own reflections and not under the influence of ideological or religious dogmas or the dictates of others.
- Peace: The transition from a secular culture of war, imposition and violence based on the perverse adage "if you want peace, prepare for war", must now be replaced by "if you want peace, work to build it each day in your everyday lives". Here again, to achieve a re-founded United Nations and efficient world governance, scientists must endeavor to contribute to the development of mechanisms capable of rapidly resolving inevitable conflicts when warranted, using adequate and modern material, without threatening life as a whole as is currently the case with nuclear weapons. From force to word. From "si vis pacem para bellum" to "si vis pacem para verbum"⁽¹¹⁾.

The main global threats that must be addressed without further delay are extreme poverty and hunger, climate change and nuclear war⁽¹²⁾.

9. <http://federicomayor-eng.blogspot.com/2016/08/urgent-new-concept-of-security.html>

10. <http://fund-culturadepaz.org/eng/03/2017/ART-EthicsofTime.pdf>

11. <http://federicomayor-eng.blogspot.com/2009/10/culture-of-peace-time-has-come.html>

12. <http://federicomayor-eng.blogspot.com/2019/02/when-vessel-is-sinking.html>

Food, access to safe water, health services, rapid, coordinated and effective action in emergency situations... - this and no other is the kind of security that "We, the peoples..." dream of and deserve. A new concept of security⁽¹³⁾...as citizens of the world, we must no longer tolerate the immense damage, the frequently mortal suffering produced by several forms of "insecurity", - whose victims are in the vast majority of cases not protected by military defense personnel.

The current trends can only be reversed by fully exercising the distinctive capacities of human beings: thinking, imagining, anticipating, innovating and creating!

Once again, I encourage everyone to re-read Article 26 of the Universal Declaration of Human Rights and the following texts: "Towards Lifelong Education for All" (UNESCO 1990); the "World Action Plan for Education in Human Rights and Democracy" (Montreal 1993)⁽¹⁴⁾ and "Learning: The Treasure Within" (the report on "Education for the 21st Century" issued by the task force chaired by Jacques Delors, UNESCO 1995)⁽¹⁵⁾. This excellent report underscores the four major pillars of learning:

- Learning to Be
- Learning to Know
- Learning to Do
- Learning to Live Together

The current trends can only be reversed by fully exercising the distinctive capacities of human beings: thinking, imagining, anticipating, innovating and creating!

And I would add "Learning to Undertake" because I have realized that in order to "Sapere aude" (Horacio), "to dare to know", we must also "Know how to dare". Otherwise, knowledge without daring becomes useless.

What really matters is learning to be, instead of learning to have. To be oneself to the fullest possible extent.

13. <http://federicomayor-eng.blogspot.com/2016/08/urgent-new-concept-of-security.html>

14. <http://fund-culturadepaz.org/DECLARACIONES%20RESOLUCIONES/montreal.pdf>

15. https://www.researchgate.net/publication/319186139_Revisiting_'Learning_The_Treasure_Within'_Assessing_the_influence_of_the_1996_Delors_Report

We must always bear in mind the difference between education and training. Training may vary substantially at times, reflecting progress made in the acquisition of new knowledge. In contrast, education is not based on aptitudes, but rather on attitudes, that is, on unchanging principles that are derived from abilities that are exclusive to the human condition.

We must always bear in mind the difference between education and training

There are no common or permanent characteristics between both procedures other than quality and accuracy, which leave no room for partisanship, bias or political agendas.

Learn to listen. Learn to share. Learn to clearly explain your views...Solidarity is crucial in order to “live together”, to recognize the equal dignity of all human beings.

From the outset, we must ensure that science and conscience interact, each in its own realm, so that we always act on the basis of our own reflections, that is, according to what our acquired knowledge and conscience compel us to do at any given moment. Conscience is the ability “of the human spirit to recognize itself, in its essence and in its changes... The sum of present or past experiences is what enables people to perceive an image of their physical and moral personality”. This is why the promotion of philosophical and creative capacities is essential at all levels of the educational process.

Yes, science and conscience, in order to firmly and boldly rectify present trends and to establish the basis for a different future of equal human dignity, providing all people access to the means they need to be able to freely develop their individual abilities.

Time for action without delay

Until recently the inhabitants of the world were confined both territorially and intellectually to extremely limited spaces. They knew very little of what was happening 100 or 200 miles away and, consequently, they strictly obeyed the standards of behavior established by their local “lords”. From the beginning of time, men exercised absolute power in a world where women appeared only fleetingly on the stages of power. A few men, only a few, exercised power over the remaining citizens, men, women and children, to the point of having to sacrifice their very lives, without any possibility of reaction, if their leaders so decided.

Some decades ago, at least 90% of all human beings were born, lived and died within a few square miles. They were consequently fearful, obedient and silent. They were passive spectators, not actors. They were recipients of often biased information, witnesses afraid to act. Silenced, silent.

The fact that we are today experiencing a fascinating moment of change in these tendencies, which from time immemorial have so greatly limited or prevented personal development, is also due to the availability of communication and information technologies that enable us for the first time in history to have a *global conscience*, such that we not only know how the inhabitants of distant places live and die, but we are now aware of the needs of others, and we can better appreciate the things we have. A global conscience not only enables the scientific community to react to the most urgent needs of others, it also encourages us to reduce both social inequalities and the most critical risks for the environment while remote participation –which has now become possible- allows us to work towards the restoration and consolidation of democracy, both on the local and global level (United Nations)⁽¹⁶⁾.

We are about to begin a year of commemoration and celebration: the 30th Anniversary of the Yamoussoukro Declaration (1989) and the 20th Anniversary of the Declaration and Programme of Action on a Culture of Peace. A summary of the main achievements that can help to establish a “road map” for the future⁽¹⁷⁾ has recently been published.

I am persuaded that the best way to commemorate the 70th anniversary of the Universal Declaration of Human Rights, the 30th anniversary of the Yamoussoukro Declaration, and the 20th anniversary of the Declaration and Programme of Action on a Culture of Peace, would be the announcement by the Secretary General of the United Nations of the adoption of the Universal Declaration of Democracy drawn up in 2010 jointly with Karel Vasak, Juan Antonio Carrillo Salcedo... and signed by Mario Soares, Adolfo Pérez Esquivel, Javier Pérez de Cuéllar, Boutros Boutros Ghali, Doudou Diene, Edgar Morin, Desmond Tutu, Rigoberta Menchú, Aminata Traoré, Alain Touraine...

16. http://fund-culturadepaz.org/eng/03/2012/ART-The_Democratic_Multilateralism_Urgency.pdf

17. <https://declaraciondemocracia.files.wordpress.com/2015/02/declaraciondemocracy.pdf>

A global conscience not only enables the scientific community to react to the most urgent needs of others, it also encourages us to reduce both social inequalities and the most critical risks for the environment

The Preamble to the Earth Charter, one of the most lucid documents of the last decade, reads: “We stand at a critical moment in the Earth’s history, a *time when humanity must choose its future*. As the world becomes increasingly interdependent and fragile, the future at once holds great peril and great promise. To move forward *we must recognize that in the midst of a magnificent diversity of cultures and life forms we are one human family and one Earth community with a common destiny. We must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace...*”

Universities at the forefront of the mobilization of “We, the peoples”

For the first time in history, “We, the peoples” are men and women and, thanks to digital technology, both know what is happening worldwide and can express themselves freely. No more silence, no more fear, no more submission. Now, at last, they can take up the reins of their common destiny, with the academic, scientific and artistic communities at the forefront of this new era, in which the transition from a culture of domination, imposition and war to a culture of encounter, dialogue, conciliation, alliance and peace will take place.

The right voice. We must firmly and consistently proclaim what science and conscience compel us to do, bearing in mind the wise words of Martin Luther King Jr.: “Our lives begin to end the day we become silent about things that matter.” Today we must urgently face the problems that can have an adverse effect on the standard of living of those who are walking one step behind us. Above all we must shed some light on the gloomy prospects hanging over all human beings at the dawn of a new century and a new millennium, and raise a major popular call for all Mars and Moon “missions” to be postponed. What we need now is an “Earth mission”!⁽¹⁸⁾

Science is the compendium of knowledge about ourselves and about nature as a whole, acquired in different stages that are increasingly larger in number and size. When analyzing data gleaned from research on any subject, researchers must exclude interpretations that are biased or conditioned by beliefs, ideology, etc. Thus, scientific rigor is a required and obligatory element of any description, research or working hypothesis that may be formulated.

The future has to be written urgently to avoid points of no return. The reins of the future must be placed individually and collectively into the hands of human beings capable of tracing the roads to tomorrow. This is especially relevant at this time, given the imperative need to re-found the United Nations in order to provide competent world governance. After the disastrous attempts at dominance on the part of groups of wealthy countries (G6, G7, G8... G20), which have led not only to a serious ethical, democratic and economic crisis, but have also concealed growing social inequalities and environmental damage, some of which is barely reversible, it is now urgent to assume the responsibility that each generation must embrace to ensure that our planet remains truly habitable.

We cannot be silent anymore. As Otto René Castillo once wrote in a telling poem:

“One day / the apolitical / intellectuals / of my country / will be interrogated / by the humblest / of our people. / They will be asked / what they did / when their country was slowly / dying out, / like a sweet campfire, / small and abandoned.”

Within a global perspective, universities should right now be mainly responsible for mobilizing all citizens of the world, in order to redress the present trends. It would be a historic error not to act firmly and without delay in order to counteract many of the current ignorant and ideologically biased initiatives sponsored by irresponsible leaders.

Now, indeed, we must decide the future of humankind. Now, indeed, all human beings must join together, join their voices and their hands.

18. <http://federicomayor-eng.blogspot.com/search/label/Misi%C3%B3n%20la%20Tierra>

Key ideas

- Re-founding of the United Nations - Multilateral democratic system.
- 2030 Agenda and Sustainable Development Goals (SDGs).
- Paris Agreement on Climate Change.
- Endogenous and all-inclusive development.
- The goal of education: creating “free and responsible” people.
- Intergenerational solidarity - “living together” - recognizing the equal dignity of all human beings.
- Promotion of philosophical and creative capacities at all levels of the education process.
- Adoption of a “Universal Declaration of Democracy”.
- Universities at the forefront of the mobilization of “We, the peoples”.

Recommendations

- Urgent enforcement of the democratic and multilateral system, with the elimination of plutocratic neoliberal groups (G6, G7, G8, G20).
- Adoption of a Universal Declaration on Democracy.
- New concept of security (it is intolerable to invest in armaments and the military while several thousands of human beings –most of them children from 1 to 5 years old- are dying of hunger and extreme poverty).
- Teaching a culture of peace at all levels of education processes.
- Using the present possibility of free expression in order to mobilize “We, the peoples” and raise our voices as citizens of the world.
- Universities must be at the forefront of the radical and urgent changes that are needed to put the SDGs (Sustainable Development Goals) and the Paris Agreement on Climate Change into practice.
- Knowledge-based solutions for the main global threats, particularly those that are potentially irreversible.

Knowledge Resistance: A Global Challenge – in Research and Education, in the Humanities and Elsewhere

Arne Jarrick

Abstract

Resistance to knowledge is as ever present in humankind as its restless quest for knowledge. The need to overcome such resistance is as pivotal for all science intending to have an impact on society as it is for the destiny of humankind itself. Rejected or ignored knowledge, whatever its importance and quality, is of little use, and people making decisions on false grounds are potentially behaving in opposition to their own interests. Scientists from all fields should make concerted and integrated efforts to combat the current anti-scientific trend – in all faculties of education as well as in research. At the same time, a balance has to be struck between the need to promote trust among people in established and solidly confirmed knowledge, such as humankind's contribution to climate change, and the need to be open to creative minorities that advance new knowledge that may seem counterintuitive and provocative to current majorities. The article will provide a number of suggestions as to the way forward in these matters.

1. The strategic significance of a knowledge-affirming attitude – for everything

The mission to promote a knowledge-affirming attitude among broad sections of society is a pivotal strategic challenge for our destiny and survival. This should therefore be a vital concern for the educational system as well as for the scientific community, and such endeavors should be organized as concerted efforts by scholars from different and too often sadly unrelated academic fields. To meet this challenge, humanist and social researchers need to join forces with their colleagues from the natural and technical sciences for a common intellectual cause. Correspondingly, students should not only study their

favorite subjects but also become familiar with those for which they do not have such a spontaneous curiosity. This is my overarching message. There are obvious reasons for the need to raise these issues.

The mission to promote a knowledge-affirming attitude among broad sections of society is a pivotal strategic challenge for our destiny and survival

First, it is largely meaningless to advance knowledge in a world of ignorance or outright disrespect for knowledge. In the short run, it is not normally a problem that people are so frequently resistant when they come across new knowledge that is counter-intuitive to their deep-rooted cognitive habits. This is a quite normal part of the progress of knowledge. The big problem is sustained ignorance, people's continued insistence on turning their back on real and important knowledge gains. What meaning do our scientific efforts have in such a stubborn anti-intellectual climate? Would this not alienate even the most curious of minds?

Perhaps it would, but hopefully it would not, since such cultural traits as knowledge are not destined to go extinct. What has been rejected can be reclaimed, although it may be too late for it to have the intended effect. A case in point could be electric cars, which were actually invented as early as the late 19th century. Due to certain technical issues, insoluble at the time, the innovation only enjoyed a very brief golden age (1900-1912) and these vehicles were soon outcompeted by gasoline-driven cars, which were faster and more reliable (Westbrook 2001). But now the innovation is about to boom on a large scale – at last. Unfortunately, however, it is probably happening too late to save the world from the contemporary problem of CO₂ breakdown.

Secondly, if people make uninformed or misinformed decisions, this will often cause unintended or even unwanted consequences. Of course, the same thing happens when people acknowledge real knowledge if

they are not willing to adjust their actions accordingly. Such inconsistency characterizes all of us – more or less. Many of us continue to travel by air despite being aware that it contributes considerably to global warming. So, our mission is certainly cognitive, but also practical: first to erase the wall of ignorance, then to weed out behavioral inertia.

Thirdly, it is as meaningless to offer new technologies, based on new knowledge, if there is no demand for them, as it is to ask for such technologies if there is no incentive to supply them. This illustrates the interdependency between technical and behavioral sciences.

Fourth, a lot of research has been done on knowledge resistance. So, why ask for more research? The reason is that most of these studies are conducted on a small scale, and are too often based on experiments carried out on people from the USA or UK. Furthermore, thus far very little research has been done on the conditions for the long-term breakthrough of basic knowledge (Jarrick, manuscript). Studies of knowledge resistance will continue to be incomplete without studies of knowledge breakthroughs in society as a whole.

Obviously, then, we are facing a strategic challenge that must be met resolutely and ambitiously if we are to prevent the disastrous development of human society worldwide, but also in order to uphold the credibility of scientific enterprise and the education system. It is therefore unfortunate that such challenges are virtually absent in all of the EU framework programs that I know of⁽¹⁾. But this lacuna only makes it even more important to stick to our basic mission as truth-seekers, in accordance with the age-old, and still relevant, Platonian definition of knowledge as justified true belief.

Our mission is certainly cognitive, but also practical: first to erase the wall of ignorance, then to weed out behavioral inertia

A knowledge-affirmative attitude is essential for the establishment and preservation of a knowledge society. However, the meaning of “knowledge society” is as unclear as its supposed omnipresence has been distinctly and repeatedly claimed, at least until it was replaced by the currently fashionable assertion, equally bold but equally poorly proven, that we are now living

in a post-knowledge society. What we understand by “knowledge society” has varied through the years and continues to vary between scholars. How has it been defined? And how should it be defined?

2. Knowledge society or post-knowledge society?

Over the last fifty or sixty years, it has been repeatedly and frequently claimed that we live in a knowledge society. In the 1960s, a growing number of social scientists, such as Robert Lane, Alain Tourraine, Peter Drucker and Daniel Bell (Lane 1965; Tourraine 1971; Drucker 1969; Bell 1973), began to characterize contemporary society this way.

One defining trait that has frequently been applied is simply that the stock of knowledge in our time is exceptionally large, and also expanding at a previously unforeseen pace. Knowledge is stored in various media outside the human brain, and the incessant introduction of new such media may indeed facilitate and speed up further knowledge growth. But it is also claimed that we, due to the plasticity of the human brain, have improved our ability to store and digest more and more knowledge within that brain. Among other methods, this is demonstrated by the so-called Flynn effect, which shows that IQs improved considerably during the 20th century (Flynn 1987).

Measured by this simple definition, it seems indisputable that we do indeed live in a knowledge society. This is the case, despite the fact that new findings are not only incessantly being introduced, but are also continuously leaking out.

According to a different approach, it is the spread and distribution of knowledge rather than its quantity or rate of growth that is decisive. The more widespread and evenly distributed knowledge becomes, the more society deserves to be deemed a knowledge society. This has become the case to such an extent that the authorities have refrained from interfering with streams of information by imposing this and banning that.

According to such a criterion, it would be reasonable to conclude that ours is a knowledge society, although not entirely so. On the one hand, it would indeed be hard to deny that, due to the rapid boom in mass education over the last century, as well as a rich repertoire of bottom-up

1. For example:

https://cordis.europa.eu/guidance/archive_en.html;
<https://ec.europa.eu/programmes/horizon2020/en/>

initiatives taken by various popular movements and other NGOs, knowledge is more widely and evenly distributed today than ever before (for instance OECD 2000; OECD 2013). Moreover, the wide-ranging freedom of the press and other media has contributed substantially to an even wider dissemination of knowledge.

On the other hand, as the total stock of knowledge gets incessantly larger, its advancement has become more and more specialized, which, *ceteris paribus*, appears to be an increasing obstacle to its digestion. More and more often in their everyday lives, modern-day people will have to rely on experts rather than on their first-hand or personally acquired knowledge. The experts themselves are no exception to this predicament. By providing shortcuts to knowledge, they enable us to utilize it without really understanding it.

A third perspective is the burden of the essential requirement for modern-day people to have a high level of knowledge, which is not only considered an asset for enabling them to get along in society, but also a stepping stone towards a good career, good health and a long life. Rising knowledge demands on the workforce and the gradual decline in unqualified jobs is claimed to be the outcome of the rapid technological development of industry, but also of the growth of the service sector at the expense of a declining industrial sector. Here, the quality rather than quantity of knowledge is crucial, but this is motivated more by business needs than by a quest for the enlightenment and democratic empowerment of the population.

Also, according to such a definition it could be considered conditionally true that we are living today in a knowledge society. Certainly, as industry has become more and more technologized and the service sector more intellectualized, a growing majority of the workforce is expected to acquire matching high level skills (Calmfors 2016). It has also been shown that the better people are at fulfilling these demands, i.e. the higher their level of education, the more prosperous and healthy they will be and the longer their lives (Marmot 2004; Nordforsk 2012; Eriksson 2001; Subramanyam et al. 2009).

However, it is not for that matter clear whether these steadily increasing demands on the workforce have to date been as demand-driven as has been frequently claimed. To a substantial degree, could they not be output driven as well? Is it really the complexity of working life that conditions these demands, or is it as much or even more to do with the abundant supply of

highly educated people that is triggering employers to demand them? Furthermore, with the rapid expansion of AI, even highly skilled people run the risk of being downgraded to less demanding activities – if any. Now, according to a very different approach, none of the three aforementioned criteria could be deemed sufficient to settle the issue. Basically, a society does not deserve to be labeled with “knowledge” unless it is characterized by a widespread knowledge-affirming attitude among its population. Rational knowledge-seeking people make efforts to base their actions on true knowledge, and not on wishful thinking. Ideally, they behave like everyday Popperians in the sense that they spend as much intellectual energy on critically examining their own beliefs as they do on those of other people.

Do human societies, looked upon this way, match these criteria? From a long-term macro-historical perspective and measured on the population level, the answer is unequivocally yes. People of today know substantially more about the world’s phenomena than they did in the past, and they also possess a larger repertoire of cognitive tools to continue extending their sphere of knowledge in the future. For example, in the High Middle Ages it took about 30-40 years to master the mathematics that today’s high school students acquire in a tenth of the time (Ericsson 2009). But most importantly, it is likely that a knowledge-affirming attitude has moved forward alongside the steady progress of knowledge as such.

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Normally, new ideas are born in the minds of particular individuals or as the offspring of the “collective” efforts of tiny minorities. No wonder then, that newborn ideas are often met with suspicion or even outright hostility, more so when they challenge people’s most profoundly cherished and often culturally inherited beliefs. Nevertheless, solid discoveries tend to gradually break through the resistance, bringing ever wider circles of people to eventually accept them. Moreover, in everyday life most people unhesitatingly make use of many things that are based on essential scientific findings that they may, however, be completely ignorant of.

This means that contemporary majorities embrace much of what past minorities failed to get their contemporary majorities to adopt, such as helio-centrism, the bloodstream as a closed system, electromagnetism, the fact that we have been through ice ages, the equally well-established fact that we are an intrinsic part of evolution, and so on. These are some of the materializations of the never-ending conflict-ridden dynamics of knowledge advancement over the years. It is a process in which people do not always regard knowledge as knowledge (handwashing), where knowledge had once not been acquired yet (negative numbers), or was once viewed as controversial (bloodstream), or that could not be proved (the evolution of species) although it often could (the earth's orbit around the sun).

As yet, we only have a limited understanding of the way this never-ending cognitive development comes about. But we can observe, again and again, the strategic evolutionary importance of minorities in its materialization, and we also know that certain general mental traits are needed to make it evolve and continue to evolve. Human beings are uniquely knowledge seeking species because we are uniquely creative, teachable, teaching, and able to think of things in their absence, implying an extraordinary ability to store very long sequences in our memory (Jarrick et al. 2018, Ghirlanda et al. 2016).

This unique creativity has propelled many types of innovations, not only those purely aimed at survival (ploughs), but also, for example, institutional (judicial systems), intellectual (mathematics), existential (funeral ceremonies), destructive (war technology) and joyful (musical) innovations. Such a categorization implies that human needs are manifold and overlapping – and that they cannot be narrowly reduced to technical patents.

3. Knowledge resistance

Now, not all humans have an open-minded craving for all new knowledge – and none always. Generally, humans do not only seek knowledge, they also seek to avoid it. So, each stage of the overall long-term progress of knowledge and a knowledge-affirming attitude is interleaved with resistance to new knowledge.

Therefore, knowledge resistance is not only a mentality that characterizes the contemporary world of “alternative facts”. It is ever present. It is, nevertheless, likely to sometimes be more widespread than at other times. According to some depressed minds of today, even

right now we are living through an exceptionally knowledge-resistant era. Is this true? The answer is that no one can tell, simply because we do not possess any long-term time-series to permit relevant comparisons. However, there are some worrying indications that things are getting worse in our time. For example, trust in science has been declining among conservatives in the USA since 1986 (Gauchat 2012). A similar downward trend can be identified elsewhere (Allcott & Gentzkow 2017). In addition, it has quite recently been shown that fake news on Twitter spreads quicker and farther than true news (Vosoughi et al. 2018).

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Again, however, since there are no longitudinal studies of the dissemination of tweets – neither earlier studies, nor recent follow-ups – we are still unable to identify trends on the basis of this information. However, the situation is worrying enough to motivate action, not least because disrespect for knowledge can be discerned in the midst of the academic community itself and not only in the wider public.

Within academia, disrespect for our basic creed appears partly as scientific misconduct and partly as a post-modern reluctance or refusal to talk in terms of truth. Researchers know that they are no better or worse than other human vessels, so they have equipped themselves with a whole set of tools to deter them from surrendering to scientifically questionable or even devastating temptations. Misconduct happens nonetheless, and this may sometimes be due to high pressure in a highly competitive and currently overcrowded system, with scarce resources – which is, of course, no excuse.

Bad scholarly manners are detrimental, but it is almost as bad that some post-modern academics show contempt of our essential creed: to systematically seek the truth (Boghossian 2006; Jarrick 2017). I know that such a statement makes some scholars uneasy, probably mostly researchers in the humanities. According to a report on humanities worldwide, a considerable minority of senior humanist scholars are even reluctant to speak in terms of scientific findings (Holm et al. 2015). Such a post-modern phobia against contact with truth and findings must be ruled out, especially in view of

the devastating disrespect for the truth among today's political leaders. If we don't stick to our basic mission as truth-seekers, then we are disarming ourselves in the struggle against all sorts of pseudo-science, not least against the post-modern rhetoric being picked up by the politicians themselves.

If we deny ourselves the possibility to distinguish between true and false statements, then what is left to be said in face of the policymakers' "alternative facts"? That truth is in the "eye of the beholder"? Or that it simply doesn't exist? Or admit that statements might be false while continuing to deny that they can be true? Such reasoning is illogical and self-defeating. Illogical, since anyone who agrees that statements can be false is agreeing that *it is true that they are false*, and consequently that truth exists. And it is self-defeating since no one – neither tax payers, nor private or public funding agencies – will be willing to support our endeavors if we repeatedly make such self-belittling declarations that we cannot provide true and trustworthy results of our efforts. Why should they?

If we don't stick to our basic mission as truth-seekers, then we are disarming ourselves in the struggle against all sorts of pseudo-science, not least against the post-modern rhetoric being picked up by the politicians themselves

A short detour is warranted here. The aforesaid applies no less to the humanities than to other sciences. Study of the human condition, historically and in the present, means inquiry into the loops of feedback from circumstances uniquely conditioning and conditioned by decision-making, meaning-seeking and culture-building agents. So it is the subject matter that distinguishes humanities from other fields of research, not the methods, which should be whatever are required, also statistics. It is certainly not the epistemology either, which should basically be the same everywhere.

Methods differ, however, because the pre-conditions for enquiry differ. Historians, paleontologists, astronomers and others devoted to the study of the past only have indirect access to their objects of study. On the contrary, green biologists and anthropologists gather knowledge about processes to which they are direct eyewitnesses. These processes would take place even in the absence of the curious researcher, although they may be and often are affected by their presence. This is not the case with experimental studies in physics, psychology and elsewhere, where certain processes can

be arranged in a controlled manner in advance and then observed in real time. Obviously, the varying conditions for research, as pinpointed here, require different methodological approaches (not to be addressed here), which, again, do not correspond with the conventional divisions of faculties. For the development and preservation of an open-minded and knowledge-affirming climate in academia, it is important to raise awareness of these cross-cutting distinctions.

Although knowledge resistance inside academia is highly disturbing, it is a minor problem in comparison to its presence in the wider society, where it is never as systematically scrutinized as it is among us academics. We have better opportunities than the general public to access reliable information, for instance that GM foods are not detrimental to our health, that AIDS is sexually transmitted, that the Holocaust did happen, that vaccination against measles does not cause autism, that homicide rates have substantially declined over the centuries, and so on and so forth. Moreover, we have access to our colleagues' criticism, and to many measures to reduce the impact of our own potential biases. One example of this is double blind tests in medical research.

Although knowledge resistance inside academia is highly disturbing, it is a minor problem in comparison to its presence in the wider society, where it is never as systematically scrutinized as it is among us academics

At the same time, the mechanisms behind knowledge resistance, as well as its manifestations, are the same for all, scientists and non-scientists alike. The introduction of double blind methods is testimony of an awareness of this, since they are based on the assumption that we cannot trust ourselves.

The general forces at work, impeding unprejudiced appropriation of knowledge, are both emotional and cognitive. Here, I can only briefly mention some of these forces (Jarrick 2017; Wikforss 2017). Emotionally, many succumb to the temptation to sacrifice truth for the sake of continued affiliation with and loyalty to their primary (or even secondary) group. Similarly, people have a propensity to continue believing what they once began to believe, whether it is true or not. This so-called confirmation bias is matched by a disconfirmation bias, i.e. a strong tendency to put considerably more effort into refuting other people's beliefs than scrutinizing one's own (Edwards & Smith 1996; Lord et

al. 1979). There are other forces at work too, such as politically motivated reasoning, which is sometimes able to cancel out people's cognitive ability to see the truth, and in certain cases people have backfired in their attempts to correct their misunderstandings of the facts (Kahan 2013; Nyhan et al. 2014). On top of these emotional factors, we also suffer from certain cognitive shortcomings, such as short-sightedness, our inclination to see causal patterns where there are none, and our inability to decode the complexity of the world's phenomena (Kahneman 2013).

4. How knowledge resistance can be overcome – in research and in society at large

So, what can be done to encourage a more knowledge-affirming attitude? In the academic community today there is an exceptional chance for a rapprochement between the human, natural and technical sciences.

This could be built on the widespread recognition of the plasticity of the human brain, as has been long-assumed by humanists and is now empirically established in the cognitive and neuro-sciences. Most of what we humans know is learnt through our experiences, and less and less is considered hardwired from birth. This could be common ground for the acceptance by humanist scholars of what viewed superficially appears to be the opposite but is just the other side of the coin: that some of our traits do have a genetic ground. That so much is acquired in human life and culture is explained by the fact that our plasticity as such is not. The unique human ability to produce culture and cultural change, without any modification of our genome as a pre-condition, is itself genetically conditioned. Here is a basis for mutual respect and understanding between different fields of research. It should be added in passing that researchers in all fields, like all citizens of the modern world, are dependent from dawn to dusk on modern technologies. None of us can go very far without the aid of countless infrastructural devices, on the micro as well as on the macro level: laptops, smartphones, physical transport systems, and whatnot. And most of these are based on advanced mathematics. On the other hand, not many of these technologies would last if they did not fulfill immaterial demands, which is another ground for rapprochement.

In the academic community today there is an exceptional chance for a rapprochement between the human, natural and technical sciences

Finally, we are facing a common threat from powerful marauders of knowledge around the world, who are ultimately threatening the survival of human civilization itself. So, we have a common cause that should bring us together, not only for the maintenance of the legitimacy of our own guild but also for our mission to promote a knowledge-affirming attitude among the population in general. How could this be done? First of all, when we come across people who we believe to be miscomprehending or shying away from the real facts, we should do what we can to reduce the distance between them and us. That would be the opposite of the predominant inclination among all sorts of media to dramatize and polarize reasonably remediable tensions between people.

Secondly, on the basis of the plasticity of the human mind but also given the seemingly ineradicable confirmation bias, efforts to promote a knowledge-affirming attitude should be introduced early on, as early as middle school, and reiterated and developed at high school, and even at college and university. Students ought to be trained to take independent views, but also to respect other people's independent views and needs for self-esteem. But to avoid instilling an overly stubborn attitude among students, they should also be trained in self-distance and suspicion of their own truth-holdings. They should frequently be taught to realize that it can be harmless and even joyful to be wrong – and to admit to being wrong. If such an education works out well, in the best of worlds maturing students will be as detached when they give up certain views as they are when they uphold them. But students also have to be taught that it can sometimes be painful to acquire real knowledge, and that grit is required in order for intellectual payoff to come true!

Students ought to be trained to take independent views, but also to respect other people's independent views and needs for self-esteem

Finally, higher level students should be exposed to "alien" knowledge domains. Whatever their choice of faculty and discipline, the study of some philosophy of science, textual analysis and so-called source-criticism, quantitative methods, academic culture of communication and last, but certainly not least, scientific ethics should be part of everyone's curriculum.

Conclusion

A lot of knowledge is needed in order to successfully meet the huge global challenges facing us today. It needs to be produced and it needs to be implemented, i.e. transformed from insights into effective practices, relieving humankind from a number of fatal threats. At the same time, it is of paramount importance to safeguard a substantial space for free, basic research, advancing knowledge whose usefulness to society cannot be pinpointed in the short run, but in many cases may prove decisive for the solution of the as yet unidentified problems of tomorrow. However, no knowledge production, whatever its motivation, is very meaningful if it never reaches people who are ready to appropriate it.

The first case is saddening, but the latter may be devastating. However, given that the results of basic research often become highly significant for society at the end of the day, it is of strategic importance to transmit such knowledge gains vertically as well as horizontally. This is what the educational system is there for.

This essay has focused on knowledge advancement and knowledge resistance. Hopefully, it is been made clear why this is a burning issue for the destiny of humankind, and why it should be taken up as one of the priority challenges in EU framework programs and elsewhere.

Recommendations

For the research community

1. Stress that the specific humanist study of the human condition means inquiry into the loops of feedback from circumstances uniquely conditioning and conditioned by decision-making, meaning-seeking and culture-building agents.
2. Researchers in the human and social sciences should join forces with their colleagues from other sciences for a common intellectual and scientific cause – to ask clear questions about essential issues, in search of the truest possible answers to these questions.
3. Fight post-modernist contempt for science and truth-seeking.

For the educational system

4. Students at most levels should be trained to take independent views, respect other people's views and to scrutinize their own views as diligently as they do those of others.
5. It should be compulsory for highest level students to familiarize themselves with knowledge domains that are not their first priority.
6. The curriculum for all highest level students should include philosophy of science, textual analysis and close reading, source criticism, academic culture of communication and science ethics.

For policymakers

7. Launch a large-scale international comparative research program on knowledge resistance and ways to overcome it.
8. Endorse policies to safeguard substantial space and resources for free basic research.

For all citizens

9. Promote a knowledge-affirming attitude in practical life as well as in theory.
10. Make efforts to depolarize the cognitive distance between people with conflicting truth-holdings.

References

- Allcott, Hunt & Gentzkow, Matthew. (2017). Social Media and Fake News in the 2016 Election, *Journal of Economic Perspectives* 31:2, pp. 211–236.
- Bell, Daniel (1973). *The Coming of the Post-Industrial Society: A Venture in Social Forecasting*, New York: Basic Books.
- Boghossian, Paul A. (2006). *Fear of knowledge: against relativism and constructivism*, Oxford: Oxford University Press.
- Calmfors, Lars (2016). Migration, sysselsättning och löner. Hur ska vi ta itu med arbetsmarknadens Tudelning, in Johan Lundberg (ed.) *Immigration, ekonomisk integration och entreprenörskap*, Stockholm: Swedish Economic Forum.
- Drucker, Peter F. (1969). *The Age of Discontinuity: Guidelines to Our Changing Society*, London: Harper & Row.

- Edwards, K. & Smith, E. (1996). A disconfirmation bias in the evaluation of arguments. *Journal of Personality and Social Psychology*, 71(1), 5–24. doi: 10.1037/0022-3514.71.1.5
- Ericsson, K. A. (2009). An Introduction to The Cambridge Handbook of Expertise and Expert Performance: Its Development, Organization, and Content, in K. A. Ericsson et al. (ed). (2006). *The Cambridge Handbook of Expertise and Expert Performance*, Cambridge: Cambridge University Press.
- Eriksson, Robert (2001). Why Do Graduates Live Longer? in J. O. Jonsson and C. Mills, *Cradle to Grave: Life-Course in Modern Sweden*, Durham: Sociologypress.
- Flynn, J. (1987). Massive IQ Gains in 14 Nations: What IQ Tests Really Measure, *Psychological Bulletin* 101, pp.171-191.
- Gauchat, Gordon (2012). Politicization of Science in the Public Sphere: A Study of Public Trust in the United States, 1974 to 2010, *American Sociological Review* 77:2, pp. 167-187.
- Ghirlanda, Stefano, Lind, Johan Enquist, Magnus (2016). Memory for stimulus sequences: A divide between humans and other animals? *PNAS*, 26/9.
- Holm, Poul; Jarrick, Arne & Scott, Dominic (2015). *The Humanities World Report*, Basingstoke: Palgrave Macmillan.
- Jarrick, Arne (2017). *Det finns inga häxor: en bok om kunskap*, Stockholm: Weyler.
- Jarrick, Arne & Wallenberg Bondesson, Maria (2018). *The Dynamics of Law-Making: A World History*, Stockholm: KVHAA.
- Jarrick, Arne (manuscript) *The Big Issues about the Human Condition: The Historian's Will*.
- Kahan, Dan et al. (2013). *Motivated Numeracy and Enlightened Self-Government*, Yale Law School Working Paper, 307.
- Kahneman, Daniel (2013). *Thinking fast and slow*, New York: Farrar, Straus and Giroux.
- Lane, Robert (1965). The decline of politics and ideology in a knowledgeable society *American Sociological Review* 31:5, pp. 649-662.
- Lord, Charles G., Ross, Lee & Leper, Mark R. (1979). Biased Assimilation and Attitude Polarization: The Effects of Prior Theories on Subsequently Considered Evidence, *Journal of Personality and Social Psychology* 37:11, pp. 2098-2109.
- Marmot, Michael (2004). *Status syndrome: how your social standing directly affects your health and life expectancy*, London: Bloomsbury.
- Nordforsk (2012). *Adding value to Nordic research cooperation. Recommendations for a new initiative on distribution of health*, Oslo: Nordforsk.
- Nyhan, Brendan et al. (2014). Effective Messages in Vaccine Promotion: A Randomized Trial, *Pediatrics* 133:4, pp. 1-8.
- OECD (2000). *Literacy in the Information Age*, Paris: OECD.
- OECD (2013). *Skills Outlook 2013*, Paris: OECD.
- Subramanyam, Malavika et al. (2009). Relative deprivation in income and self-rated health in the United States, *Social Science & Medicine* 69:3, pp. 327-334.
- Touraine, Alain (1971). *The Postindustrial Society. Tomorrow's Social History: Classes, Conflicts and Culture in the Programmed Society*. New York: Random House.
- Vosoughi, Soroush, Roy, Deb & Aral, Sinan (2018). The Spread of True and False News Online, *Science* 359, pp. 1146-1151.
- Westbrook, Michael H. (2001). *Electric Cars: Development and Future of Battery, Hybrid and Fuel-Cell Cars*. London: Institution of Electric Engineers.
- Wikforss, Åsa (2017). *Alternativa fakta: Om kunskapen och dess fiender*, Lidingö: Fri Tanke.

2. What roles do universities play in the defence and promotion of humanistic approaches in all areas of knowledge and how are those roles addressed in the world's different education systems?

Consilience between the Sciences and the Humanities: Small Steps towards a Humanistic Education

Ahmed Bawa

Abstract

Universities of the 21st century face enormous challenges due to foreseen and unforeseen tensions in their purpose as social institutions. While complex and multi-layered changes in the external environment impact their knowledge project, there are also contradictions emerging from their internal organisation due to rapid massification, often in the context of underfunding and increasingly tenuous relationships with the labour market. In this paper, four major changes occurring worldwide are examined together with some indications of how universities are responding to them. The first is the significant erosion in trust of experts and its subsequent impact on democracy, often represented by a growing disjuncture between the conventional understanding of scientific knowledge and the alternative ways in which the social construction of the understanding of that knowledge occurs. The second relates to the fact that many sociopolitical and economic challenges faced by humanity are simultaneously intensely local and global in nature. The development of a global commons of scholars and of processes of knowledge production is fundamental to achieving the drive to address these. The third relates to the development of new modes of knowledge production due to the rapid changes emanating from what is referred to as the Augmented Age, signalled by intensified human-machine nexuses and artificial intelligence. The fourth are increasingly complex changes taking place in the world of work epitomised by shorter working weeks, the rapidly unfolding gig-economy and the concomitant challenges of structural unemployment. These have profound implications for the knowledge project of universities. Addressing these requires the intensification of the humanistic project of higher education, even when this must embrace new approaches to the organisation of knowledge production and dissemination in higher education. It is argued here that the (re)-insertion of humanism into the knowledge project of universities is central to reestablishing trust among their publics.

Introduction

In the first quarter of the 21st Century we are experiencing some of the most powerful forces of social and physical disintegration, notwithstanding solid evidence that much progress is being made in terms of addressing several of the Sustainable Development Goals (see for example, Sachs 2005). The rapidly deteriorating human-earth nexus threatens the future of humanity. Widening inequalities both within nation-states and between nations, the devastation of continuing wars, the ravages of infectious and lifestyle diseases and massive human migrations are examples of this kind of devastation. These are occurring despite the vast and powerful advances made in science and in other areas of human endeavour.

Globally too, there appears to be growing concern about the erosion of trust and confidence in science witnessed through a slide into a pervasive anti-intellectualism. In many parts of the world there are clear indications of the growing lack of confidence in preventative health measures such as the use of vaccinations and the profound challenges facing societies such as South Africa to eradicate HIV/AIDS and other infectious diseases, notwithstanding the massive expansion of educational programmes and prophylactic treatment. The perverse use of science and technology in the design and development of increasingly efficient human killing machines is shocking in scale and innovation. Significant national expenditure on science and technology does not necessarily translate into improvement in the quality of life of human beings.

The student activism that rocked South Africa between 2015 and 2017 raised a number of important higher education issues but perhaps the most important was what the students referred to as broad epistemic exclusion, the need for the decolonisation of the knowledge project of universities. Even though the issues articulated by the students were neither coherent nor cohesive, the universities took them seriously. During this period,

there was opportunity too to consider what appeared to be a breakdown in social ownership of universities. All of this was happening at a time when, by all traditional metrics, the university system was performing better than ever before.

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Universities as Social Institutions

Universities as social institutions have been involved in the pursuit and the application of knowledge for many centuries. They have contributed to improving the quality of human life but also to the highly destructive forces of military-industrial complexes and to the growing destruction of the human-earth nexus through their role in designing technological instruments for the maximisation of profits and consumption. The growing legitimacy gap that universities experience in many societies is represented in many ways. The apparent discontent of national governments is represented through the erosion of institutional autonomy and academic freedom and severe funding cuts. More importantly, it is the growing chasm between universities and their publics that is of deep concern. On the one hand, there are outright critiques of universities as a part of the oppressive infrastructure in societies like South Africa in which deep levels of poverty and inequality persist. On the other hand, as was pointed out above, there are clear indications of the growing distrust of universities stemming largely from growing perceptions of alienation, and of apparent disconnection from local contexts, both philosophically and in terms of their knowledge projects.

At the same time, universities are constantly and correctly regaled about the vast and potentially revolutionary changes taking place in technology and in the interfaces and integrations between machines and humans, about new human adventures in artificial intelligence and machine learning, deep learning, etc. They

are also very rapidly being tasked with interrogation of the vast changes taking place in the labour world through the automation of existing jobs and shifts towards the gig-economy. Concerns related to this new technologically inspired labour world could further entrench socioeconomic disparities (WEF 2017).

The apparent discontent of national governments is represented through the erosion of institutional autonomy and academic freedom and severe funding cuts

Revolutions in the labour world are by no means a new phenomenon. Each of the previous technological eras raised the impact of such transformations on the quality of people's lives. One may recall the deep impact that Gandhi's visit to the East Lancashire cotton mills had on him in his observation of impact of the machines on humans. Colloquially this era is referred to as the 4th Industrial Revolution and its uniqueness perhaps is simply the extraordinary rate at which technological innovation is unfolding (Schwab 2018).

This powerful conjunction of rapid technological development, deepening social, political and economic crises and the rapid deterioration in the earth-human nexus create an exciting, though daunting context for universities. They present interesting opportunities for the creation of new relationships between the institutions of higher learning and their local and global publics through the emergence of new forms of humanistic education; one possible element of which, as shall be argued below, is the need for richly diverse convergences between the sciences and the humanities.

Some thoughts from the Sciences

Erwin Schrödinger, while in exile in Dublin, gave a series of public lectures on science and society, which were published in a little book titled *Science and Humanism* (Schrödinger 1951). He was deeply concerned about the ways in which science impacts society. Acknowledging the importance of the extraordinary deep levels of specialisation at the cutting edges of science, he raised concerns about the impact this had on the value of science to society. In response to a hypothetical question: what is the value of natural science, Schrödinger's

response is: 'Its scope, aim and value is the same as that of any other branch of human knowledge. Nay, none of them alone, only the union of all of them, has any scope or value at all' (Schrödinger 1951).

C.P. Snow in his Rede Lecture of 1959 titled *The Two Cultures* raises similar questions when he describes the bifurcation in "the intellectual life of the whole of Western society" into two cultures – the sciences and the humanities, which he thought was a major impediment to solving humanity's problems (Snow 1959). Snow identified the challenge largely as one of education, as ensuring that at least the educated classes should have thorough knowledge of the both arms of knowledge. In subsequent work, he referred to the emergence of a 'third culture', the emergence of a new generation of scholars who were in intellectual communion with each other from across the science-humanities divide so as to be able to harness all of knowledge for human well-being. The 'Third Culture' thematic is also taken up by others. John Brockman, for instance, argues that C.P. Snow's conception of the 'third culture' was based more on hope than on shifts in intellectual culture; that the main articulation between the humanities and sciences is the extensive new writing by scientists trying to reach audiences that 'have a great intellectual hunger for new and important ideas and are willing to make the effort to educate themselves.' (Brockman 1991).

Some thoughts from the Social Sciences

At a more analytical level, the Indian anthropologist, J.P.S. Uberoi, in his brief but important *Science and Culture*, argues that the separation of the sciences from the church (and therefore culture and politics) during the Reformation produced a system that delinked scientific 'facts' from values.

'I may somewhat simplify the structure of the new regime by saying that its two fundamental axes were the division between fact and value, on the one hand, whether or not value was bifurcated into the instrumental versus the symbolic; and the division between lexis and praxis, theory and practice, on the other hand. These dividing lines were drawn hard and fast and they marked out the four quarters of modern Western civilization to be occupied by the new science, technology, philosophy and poli-

tics or ethics. The thesis is that this is the elementary structure of the positivist regime as a system, which produced the inner organization of modern Western science, on the one hand, and its relations with the whole of modern Western culture, on the other hand.' (Uberoi 1978).

Uberoi argues that this separation of science and technology from philosophy and ethics tears apart the relationship between scientific knowledge and its production from the world of philosophy, culture and values and that this becomes the defining form of what he calls Western science. He argues further that the new '*empirical scientist* invariably proceeded or thought he should proceed from the part to the whole; the piece to the pattern; the element to the set; observation to inference; experience and experiment to theory and intuition; analysis to synthesis; the simple to the complex; the concrete to the abstract; the outer to the inner; and the object to the subject' (Uberoi 1978). This is an important categorisation of positivist science in its explorations of universal truths as deeply reductionist in seeking its solutions of complex, integrative wholes. In *Science and Culture*, Uberoi continues his analysis by exploring the role of science (and 150,000 scientists and technicians) in the Manhattan Project and its subsequent delivery of the atom bombs that obliterated Hiroshima and Nagasaki and produced the death, and injury to 300,000 people (Uberoi 1978).

Shiv Visvanathan, in his provocative and unsettling essay, *On the Annals of a Laboratory State*, probes exactly what transpires when human development is seen and shaped as if it was a scientific experiment. Visvanathan traces the philosophical origins of modern science to Bacon's 1620 classic *Novum Organum* and to Descartes' *Discourse on Method* published in 1637. But he goes on to claim that that this genealogy is completed by Thomas Hobbes' *Leviathan* which he argues provided the philosophical schema for science. This for all intents and purposes connects science to political power and to development. Visvanathan continues:

'One can see the same trend in the modern discourse on development. Development should be regarded as a scientific project. It represents the contemporary rituals of the laboratory state. As a project, it is composed of four theses, ingrained in the logic of Western science, of modernity as technocracy. One can call them:

1. The Hobbesian project, the conception of a society based on the scientific method;

2. The imperatives of progress, which legitimize the use of social engineering on all those objects defined as backward or retarded;
3. The vivisectional mandate, where the other becomes the object of experiment which in essence is violence and in which pain is inflicted in the name of science;
4. The idea of triage, combining the concepts of rational experiment, the concept of obsolescence, and of vivisection - whereby a society, a subculture or a species is labelled as obsolete and condemned to death because rational judgement has deemed it incurable.

Development as a technocratic project includes all four themes. In fact, if concepts could ever be death warrants, the above glossary could be regarded as genocidal.' (Visvanathan 1997)

Visvanathan essentially draws out conclusions that flow from the Uberoi's idea of bifurcation of science and technology from philosophy, culture and social systems of values following the Reformation.

Science, Technology and Human Development

There is universal consensus on the potential of science to impact positively on improving the quality of people's lives. The question that remains is to understand how societies take up science, to what extent the science is organically connected with lived experiences of those whose lives it impacts and the level of pervasiveness of the practice of science and its applications so that issues of alienation do not undermine this potential. And yet there are deeper underlying issues with questions such "science and innovation for who?" the type of question that Shiv Visvanathan would ask about India's green revolution, for instance.

What can we learn from these writings? Universities as social institutions are required to maintain a strong and vibrant connection with their publics. One of these concerns the building of knowledge enterprises that are both intensely local and global simultaneously so that individuals in society can see themselves and their lives somehow represented in these institutions of higher learning. Integrative approaches require new relationships between knowledge domains, and in particular between the sciences, humanities and social sciences, to address Schrodinger's need for science to be consid-

ered *wissenschaft*, as one element of the global body of knowledge, or C.P. Snow's desire for the emergence of a third culture, or Uberoi's cry for a reunification of science, technology, philosophy and ethics. This would form the basis for the emergence of new thinking on research and education underpinned by humanism.

Experiments with Bridges between the Sciences, Social Sciences and Humanities

Academic disciplines are powerful institutional structures. It is the way in which universities organise themselves. Peter Scott, who has worked in this area for a long time, points out that

'Academic disciplines are contingent, almost accidental and highly permeable. They lack consistency. Some are rooted in common sets of theoretical questions; others in common problems (and maybe social affinities); others again in shared methodologies (and even experimental and investigatory techniques and instruments); and others again mirror professional domains (while also shaping them)' (Scott 2017).

Scott describes the various mechanisms that cause the emergence of new disciplines and the evolution of existing ones through mergers, fragmentation, new trends in professional development, etc. We therefore need to think of the current way in which universities are organised as in a state of viscous fluidity. There are indeed new constructions that challenge what may appear to be the hegemonic position of the disciplinary model in the organisation of universities and these occur primarily where the knowledge enterprise encounters 'the real world'. Edward O. Wilson in his influential book *Consilience: The Unity of Knowledge* refers to William Whewell's idea of consilience in his 1840 synthesis *The Philosophy of the Inductive Sciences*, which portrays the concept as the 'jumping together of knowledge by the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation' (Wilson 1998). Wilson, regarded as one of the leading scientists of the 20th Century, believed that all knowledge - sciences and humanities - by its nature is unified, governed by a set of natural laws. How are universities around the world grappling with such ideas?

Drawing on the study of university-industry research and development activities, Gibbons, et.al. come to similar conclusions in their book *The New Modes of Knowledge Production* in which they describe the emergence of what they refer to as Mode 2 knowledge (Gibbons et.al. 1994). In essence, this refers to industry-university research built on the basis of an applications imperative rather than an academic one. The research team comprises both academic and industry-based personnel who jointly shape the research question. They are invariably interdisciplinary/transdisciplinary teams, transient in nature because they depend on the project. They have multiple outputs; traditional research papers, research reports, patents, etc. As South Africa transcended its apartheid past, it also embarked on a rigorous analysis of the knowledge project of its universities and parastatal science councils (Kraak, 2000). In the construction of its approach to research and development much emphasis was placed on Mode 2-type thinking as a way to explore the linkages between basic, applied and product-related research. Structural changes necessary to foster this new kind of knowledge production did not materialise. In particular, while universities committed themselves to interdisciplinarity these commitments did not translate into structural and policy changes and while there are some excellent examples of this form of knowledge production, their sustainability was stymied by the traditional structural forms that are so pervasive and powerful in university decision-making structures. Following a large study, Weingart, for instance, has shown that the advent of Mode 2 knowledge production has not had any lasting impact on the fundamental way in which disciplines function (Weingart 1997).

The establishment of interdisciplinary centres for research and education has also taken root in most research-intensive universities. These are either within the sciences or humanities or social sciences or they may indeed straddle these domains. One example of this is the Urban Futures Centre at the Durban University of Technology that brings together engineering, social sciences and humanities in the reimagining of urban complexes as South Africa's population steadily migrates into urban centres that are ill prepared for new influxes. Most interdisciplinary centres are created to address some pertinent issue that is often related to the 'real world', bringing together relevant but diverse voices but also having the power to assemble research and student teams that span a number of

disciplines. These centres often represent the opportunity for knowledge in what may be referred to as the borderlands between industries. They often struggle as structures within institutions, not simply as a result of bringing something new to academic structures but mainly because the budgeting systems of most universities are discipline- and school-based. In addition, perhaps the most vital challenge to sowing these possible seeds of change is the fact that they are usually established through and are dependent on external funds. There may also be sociological reasons such as the fact that scholars usually take their academic identities from disciplines.

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A return to C.P. Snow's lecture may provide a third approach. It may be hoped that there will be a slow evolution in the nature of the relationship between the different macro branches of knowledge perhaps through Brockman's formulation of the 'Three Cultures', whereby as scientists write for the broader public this will also lead to new signature engagements between scholar-intellectuals from a wide range of traditions both within and without academia.

A fourth approach that may give impetus to the issue of transformation in the nature and production of knowledge may be the large and expansive approaches to national open science platforms as a way to institute broader access and hence more accountability and engagement. This, together with the citizen science movement, may provide the basis for new adventures into integrated approaches by individuals and teams who are not totally interwoven into the disciplinary structure of knowledge (Bawa 2018).

In societies that are home to multiple, coexisting knowledge systems, it is likely that a fifth approach will give impetus towards more integrated, less reductionist approaches to the knowledge enterprise; addressing in the process the issue of cognitive justice as a human rights and social justice issue. This will seek deeper engagement between the processes of knowledge production and 'new ways of knowing'. In addition to anthropological investigations, one way of probing this coexistence and interaction between different

knowledge systems is through studying the social construction of scientific knowledge, which has enormous implications for policymaking; as is being observed in the fight against HIV/AIDS. In the South African context, this is very much at the heart of the decolonisation of higher education debate (Bawa 2018). Visvanathan developed the idea of *cognitive justice* as a form of human right, underpinned by an understanding that there exists a plurality of knowledges and that each has the right to exist and to co-exist in the pantheon of the world of knowledges.

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Of course, these five approaches, and others, may well interweave with each other in producing new approaches to knowledge that will potentially contribute to the emergence of a humanistic knowledge enterprise and hence humanistic research and education. The discussions/debates/experiments on interdisciplinarity, transdisciplinarity, the construction of centres that straddle academic departments, etc. have been ongoing for decades. Lessons have and are being learnt from these. The question remains however, as to whether there is need for a deeper, more transformative, shift in understanding the nature of integrated forms of knowledge as they pertain to the role of universities in society.

Concluding Thoughts

The advances in artificial intelligence and deep learning, robotics, data warehousing and data analytics, the possible proliferation of new forms of human-machine nexuses together with (potentially) vast changes taking place in the labour market also have consequences for the knowledge project of universities – teaching/learning, research and innovation. Added to this are the complex and vast changes in the world of genomics, genetic engineering, bioinformatics and the rapid rise of automated analytical power in many areas of knowledge

production. Reports of genetically modified children, of human genome determinations on 100% of UK's population, etc. all generate major philosophical and ethical questions about the trajectory of science and its applications. California's decision to ban facial recognition technology resulted from human rights concerns. These open up further vistas (or are they wormholes) of possible investigation in this integration process.

Each of these is intensely a matter of science and its applications and a matter of social, emotional and human agency and wellbeing. They are each shaped in a cauldron of political, social and economic interests raising yet again the question of 'science for who?' These are questions that require deep and abiding engagement between science and the humanities and social sciences. From a higher education point of view, the question could well be expressed as: what is to be done to improve the social ownership of institutions and their knowledge projects?

Not only are these underpinned by major epistemological and pedagogical challenges, the problem with each of these is that the construction of national and/or institutional knowledge projects is not ideologically neutral, as has been observed in the past. How are universities, the scholars within them, students and the many publics of knowledge producing institutions to navigate such complex terrains? While this would seem to be an intransigent problem because it is tied to the balance of forces in any society, it also opens up the possibility of new conversations that must draw on all branches of knowledge.

Physics and other disciplines that have made such progress through reductionism are constantly throwing up ideas of complexity that undermine the efficacy of traditional reductionist approaches. They turn to new integrative approaches that will imprint themselves on the continuing study of the universe (Gefter 2014). General relativist Naresh Dadhich, at the Inter-University Centre for Astronomy and Astrophysics in Pune, India, points towards the impact of pluralistic traditions in Indian intellectual and community life on young developing minds. He asserts that this may generate tensions within scientific enterprise – tensions between the plural and the digital, between the integrative and reductionist (Dadhich 2014). Presaging this notion of integration, Schrödinger initially titled his little book *Science as a Constituent of Humanism*. There are profound lessons to be learnt about the importance of the unification of knowledge.

References

- Bawa, A.C. (2018). 'Re-imagining the social purpose of universities through Engagement' in *Higher Education for Diversity, Social Inclusion and Community: A Democratic Imperative*, eds. Sjur Bergen and Ira Harkavy. Council of Europe Higher Education Series No. 22.
- Brockman, J. (1991). *The Third Culture*, *Edge*. https://www.edge.org/conversation/john_brockman-the-third-culture
- Dadhich N. (2014). 'The Indian Plural Mind.' *Economic and Political Weekly* Vol. 49, Issue No. 10, 08 Mar, 2014.
- Gefter, A. (2014). 'Theoretical Physics: Complexity on the horizon.' *Nature* 509 PP.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., Trow, M. (1994). *The New Production of Knowledge; The Dynamics of Science and Research in Contemporary Societies*. London: Sage Publications.
- Kraak, A. (2000). *Changing Modes: New Knowledge Production and its Implications for Higher Education in South Africa*. Pretoria: Human Sciences Research Council
- Sachs, J. (2005). *The End of Poverty: Economic Possibilities for Our Time*. New York: Penguin Books.
- Schrödinger, E. (1951). *Science and Humanism: Physics in Our Time*. London: Cambridge University Press.
- Schwab, K. (2018). <https://www.weforum.org/about/the-fourth-industrial-revolution-by-klaus-schwab>
- Scott, P. (2017). Undisciplining Knowledge: Interdisciplinarity in the Twentieth Century, *Interdisciplinary Science Reviews*, 41:4, 391-395, DOI: 10.1080/03080188.2016.1248676
- Snow, C.P. (2001) [1959]. *The Two Cultures*. London: Cambridge University Press. ISBN 978-0-521-45730-9.
- Uberoi, J.P.S. (1978). *Science and Culture*. Delhi: Oxford University Press.
- Visvanathan, S. (1997). *A Carnival for Science in A Carnival for Science: Essays on Science, Technology and Development*. Delhi: Oxford University Press
- Weingart, P. (1997). "From 'Finalization' to 'Mode 2': Old Wine in New Bottles?" *Social Science Information* 36: 591-613.
- Wilson, Edward O. (1998). *Consilience: The Unity of Knowledge*. New York: Vintage Books.
- World Economic Forum (WEF). (2017). *The Future of Jobs and Skills in Africa Preparing the Region for the Fourth Industrial Revolution*, available at <https://www.weforum.org/>

Case Study — Humanities in All Degrees: The Case of the International University of Catalonia (UIC)

F. Xavier Escribano, Gabriel Fernández-Borsot, Judith Urbano

A remarkable aspect of the founding spirit of the International University of Catalonia was the will to provide comprehensive training that includes, in addition to the conventional knowledge and competences specific to each degree, a general humanistic education. Since our foundation in 1997, university-wide humanistic education has been one of our distinctive traits, and we consider its implementation to be an example of a successful case.

From the beginning, this implementation was commissioned to the Faculty of Humanities and, as it was so innovative, it was deployed in different phases. Initially, humanistic education was introduced to the curricula through courses on “Thought” and “Ethics” (on our Humanities and Social Sciences Campus), and “Anthropology” and “Bioethics” (on our Health Sciences Campus) in each case consisting of 12 ECTS for all degrees. The contents of these courses were based on the Greek and Latin classics, the most relevant philosophers of the modern era, and the classical texts and authors of the Semitic and Eastern traditions. Regarding methodology, the courses were organized into two distinct kinds of session: theoretical lectures and practical classes, both with the same number of class hours. Although the theory sessions included a certain amount of dialogue and debate, student participation was especially required in the practical classes, by interpreting and analyzing texts and multimedia contents.

A key factor behind the success was the effort put into coordinating faculty. Considering that the program involves more than ten degrees distributed across two campuses, lecturers not only had to coordinate theoretical and practical sessions for each course, but also between different courses. The latter was especially relevant in the first years, as the program was so new and an innovative set of contents needed to be created. The main coordination instrument was the weekly seminar,

where all theoretical contents and practical activities were analyzed and discussed, and where all lecturers shared their findings, ideas and concerns, contributing significantly to a sense of unity across faculty.

To ensure and monitor teaching quality, certain specific procedures were established, such as meetings between the Dean of the Faculty of Humanities and the Deans of the other Faculties, at least twice a year, as well as regular student surveys to monitor satisfaction, and collect suggestions and complaints.

After approximately ten years of satisfactory results in terms of both faculty and students, the program entered a second phase due to the need to integrate into the European Higher Education Area (Bologna Process), which implied a complete redesign of all curricula, with new requirements. Some program managers were afraid that their degrees would not obtain the official accreditation due to the presence of humanistic subjects, which might be viewed as alien to the corresponding disciplines. Those were moments of major turmoil, with pressure to change the titles and contents of the humanistic courses, and to reduce or even remove them. Seen retrospectively, these vacillations were a strategic error that eroded unity and introduced some minor inconsistencies to the university-wide humanistic program, although its essential traits were not affected. The process also produced a highly positive aspect: an awareness of the need to adapt the humanistic courses to the specific idiosyncrasy and professional profiles of each degree. This adaptation was done by balancing general, in-depth, humanistic education with some applied humanistic training connected to the specific interests of the students on each degree. Since then, this approach has been our benchmark, and now, after 22 years of trial, error and refinement, we can say that we have coordinated an original synthesis between classical humanistic contents and the relevant issues and

main problems of the diverse fields, such as law, education, healthcare and architecture, to name but a few. The different degree communities do not regard the humanistic courses as a foreign or unnatural addendum, but as a complementary perspective that helps students to understand the epistemic, anthropological and ethical foundations and principles of the corresponding field.

The aforementioned weekly seminar was overhauled in this second phase, incorporating such initiatives as a project called “Thinking with images”, consisting of creating a database of images which, by virtue of its symbolic content, fosters rich hermeneutics related to the contents of the humanistic courses. The possibility of exchanging materials –favored by the universal language of images-, and of discussing interpretation, offered faculty a new opportunity for exchange and mutual enrichment, adding a research dimension to the coordination, and revealing how humanistic courses can foster integration between teaching and research.

We are currently entering a third phase of the program, which reflects the maturation achieved in the previous two phases. As occurs with any new idea, the early stages of development implied sudden changes and rapid evolution, while maturation calls for stabilization and minor adaptations. In this third phase, we aim to keep on developing the positive aspects discovered in the previous phases, while avoiding the mistakes. In synthesis, the key points that are guiding us in this new phase of the process are the following:

- Preserve and promote the richness and depth of the humanistic contents.
- Adapt the contents to the idiosyncrasies and professional profiles of each discipline.
- Create anthologies of selected texts and multimedia materials, both general and specific to each discipline.
- Reinforce faculty coordination through regular seminars, to create a sense of unity in the program and to promote collaborative research.
- Emphasize quality assurance mechanisms, especially coordination between the Faculty of Humanities and other Faculties.
- Promote open seminars and lectures, to increase awareness of the relevance of the humanistic perspective for all fields.

Case Study — The Importance of Interdisciplinarity and Intercultural Practices

Fátima Marinho

The universities of the 21st century have to deal with new challenges. They can no longer be places for the elites or detached from society. In the mid-20th century, the social balance changed considerably and universities had to deal with a new generation of immigrants, with new hopes and new goals. A change of paradigm was required and social and economic environments became part of the universities' world. The interaction between Higher Education Institutions (HEI) and these broader environments led to radical changes in the way faculty and students behaved. The Social Sciences were more profoundly aware of political and social problems, and played an important role in mapping the past, understanding the present and shaping the future.

Universities will survive only if they can adapt to change and to the new challenges arising from the social fabric and the interests of students coming from very different parts of the world: both developed and less developed. Now more than ever before, Universities need to be deeply committed to understanding the other as well as respecting and appreciating difference. Keeping these factors in mind, we can say that HEIs have to find a balance between social needs, research and innovation. Such a balance is not easy to attain, but is essential for an inclusive and multicultural society.

We are currently experiencing a general crisis that has changed the way we view our world, including the traditionally comfortable role played by universities in society; traditional learning and teaching procedures; student profiles; and leadership patterns. Such problems can only be overcome by devising a new type of leadership, which should pay more attention to detail and to single individuals; have greater capacity for dealing with people's problems and differences; and also avoid power for power's sake and eagerness for public recognition. An acute awareness of difference and its importance in a changing world is intrinsically connected with a genuine willingness to understand other people's opinions, cultures, religions and customs,

as well as a greater focus on cooperation for development, which implies respect for other people's needs and decisions.

In a changing world, universities play a decisive role in social revolution and should show real commitment to gender equality and the inclusion of ethnic minorities, different religious values, and cultural rituals.

Nowadays, research cannot be confined to narrowly specific fields, forgetting the fundamental interdisciplinarity that young generations yearn for. Linkage between different fields is becoming more and more important, and teachers need to face this new reality, discover those links and support students' research and interests in these fields. A different attitude towards the learning and teaching process is not only required but also highly appreciated, and programmes that are able to connect different fields are generally very successful. A comprehensive HEI, such as the University of Porto, is in a good position to develop and improve such programmes due to the varied faculties and vast array of subjects it offers. The increasing number of shared degree programmes (currently over 25 at BA, MA and PhD level at UPorto) between the different faculties, with their shared teaching and supervision of research, is giving rise to teaching and learning activities that are much more focused on the specific interests and skills of students from highly diverse backgrounds. Recent experiences show that students tend to look for degree programmes that are shared by two or more universities. These programmes, mainly at PhD level, are very attractive insofar as they can offer a wide range of different research areas and skills. At UPorto, more than 20 programmes are shared with other Portuguese and foreign universities. Seven Portuguese Universities share programmes with UPorto, namely the University of Aveiro, the University of Minho, NOVA University Lisbon, the University of Trás-os-Montes and Alto Douro, the University of Coimbra, the University of Beira Interior and the Porto School of Nursing. UPorto also shares Master's and PhD programmes with foreign universities.

The interdisciplinarity that characterises many of these programmes improves several kinds of learning outcomes and can play an important role in intercultural practices, highlighting the connections between culture and structure, academic freedom and institutional autonomy.

Mobility of teaching staff within the same university, between subject areas and between different HEIs is essential and encourages the cooperation needed for interdisciplinary work. The benefit of meetings between faculty members from different backgrounds and the knowledge acquired from visiting other social and cultural environments are crucial for establishing shared programmes.

In the past two decades, the University of Porto has been actively looking for strategic partnerships with universities that are not located in its traditional comfort zone (Europe, North America and Brazil) but in Asia, Africa and the South Pacific (Australia and New Zealand). Cooperation with institutions from very different cultural traditions has enabled us to acquire new knowledge – experiential rather than academic – which undoubtedly contributes to union and understanding among peoples.

In full awareness that effective internationalisation will only be achieved if the mobility of students, teaching staff and non-teaching staff is combined with research and the sharing of best practices, UPorto is deeply committed to creating the best conditions to reach this goal. Interdisciplinarity and the creation of several programs that actively refresh it respond to the needs of a society that is constantly dealing with new demands and interests. As UPorto strives to respond to new demands, it is working to offer its students and teachers the right kind of training to take a competitive and aggressive attitude in an increasingly heterogeneous and heterodox global labour market.

Increased interdisciplinarity is one of UPorto's missions in order to promote an understanding of the cultural differences in a richly multicultural society. This diversity, however, can also be a source of tension and conflict and it is therefore essential to build bridges between different groups.

This can only be done, however, if there are links and if communication is simple, smooth and natural. For many centuries, the Portuguese have been aware of how essential knowledge of other peoples' languages is

for exchange, from trade to culture. This feeling, which is commonly accepted and experienced in so many different situations, is even more urgent in a globalised world characterised by intense transit between different communities with no tradition of exchange. Today, it is almost unthinkable for someone with managerial responsibilities to be unable to communicate in at least one foreign language or be unable to interact without the help of an intermediary, which, whether we like it or not, makes communication more difficult. There can be no real interaction without the ability to create and foster the type of collaboration and involvement that can only stem from the sharing of a common code.

To conclude, after reflecting on how higher education institutions can enhance new learning techniques and procedures, we could single out the following keywords: interdisciplinarity, mobility of students and teaching staff, new learning outcomes, interdisciplinary tutorials, different fields of knowledge, ability to understand other people, their languages, cultures, religions, and customs.

Case Study — Integrating Technology with Humanities and Social Science: Endeavors of a Global University in Rural India

Nandita Koshal

The advent of Industry 4.0 with technology, innovation, and creativity as its cornerstones has necessitated the creation of a skilled workforce and generation of experts that can successfully meet the challenges brought by the fourth industrial revolution. To cater to the demands of industry and society in this ‘innovative era’ (Puncreobutr, 2016) a similar revolution in Education in the form of Education 4.0 is needed. A crucial component of Education 4.0 is the integration of technology, innovation, imagination and creativity in the overall landscape of education. This is essential to bring about transformation in pedagogical approaches, learning management systems, overall student experience, and campus design and infrastructure. While pedagogical approaches can be revolutionized by developing a curriculum that blurs the disciplinary boundaries and celebrates disciplinary integration, technology can be assimilated into teaching and learning systems through the use of innovative teaching and learning tools. Disciplinary integration can take the form of multidisciplinary, interdisciplinary and transdisciplinary (Begg and Vaughn, 2011) knowledge.

The inter-disciplinarity and integrative approaches acquire a special role in generating synergies between disciplines of humanities and sciences. According to the National Academies of Sciences, Engineering, and Medicine 2018 Report titled ‘The Integration of the Humanities and Arts with Sciences, Engineering, and Medicine in Higher Education: Branches from the Same Tree’ there are growing efforts towards “integration of knowledge and pedagogies in the humanities, arts, social sciences, natural sciences, engineering, technology, mathematics, and medicine”. The efforts aim to create new course models that focus on SHTEAM (Science, Humanities, Technology, Engineering, Arts and Medicine) education or “Liberal education”.

In this digital age, universities are faced with the challenge of integrating technology and staying relevant on one hand while keeping the ‘human’ essence of knowledge transferred intact on the other. In this context, the O.P. Jindal Global University (JGU) is an interesting model of a social science and humanities university that is successfully integrating technology in its overall teaching and learning system.

JGU is a multi-disciplinary, technology-driven, social sciences university located in rural Sonipat, in the National Capital Region of Delhi in India. As an interdisciplinary research-driven university fostering excellence in teaching, research, capacity building, community service and nurturing social leaders, JGU aspires to be a paradigmatic world-class university promoting excellence and setting benchmarks in higher education. JGU recognises technology and innovation as vital tenets of social science education and has intricately inculcated the culture of technology and innovation in its teaching, pedagogy, curriculum, research and administration. JGU’s commitment to integrating technology with social science education is further strengthened by the co-existence of dedicated centres working on the intersection of technology, society and innovation.

JGU integrates technology in the following ways to enhance social science and humanities education in the university space:

Academic Integration

JGU successfully integrates humanities and technology in the university space through the interdisciplinary courses taught at its 8 interdisciplinary schools. The overarching office of Academic Planning, Co-ordination and Interdisciplinarity that oversees development of the curriculum, course structure and technology-driven syllabi promotes an environment of interdisciplinarity

and innovation in teaching and learning ecosystems. There are multiple courses and electives offered that explore the intersection of humanities, sciences and technology. Some of the courses offered that draw from the elements of both Humanities and Technology include: *Economics of Innovation*; *Basic and Advanced Forensic Sciences*; *The Culture of Cities: Space, Time and Architecture*; *Science and Technology Policy*; *Information Technology Law: Challenges and Impact*; *Towards The Ethical – Science Fiction And Fantasy As Philosophical Thought Experiments*; *Big Data Analysis for Managers and Lawyers*; *Global Business Technology*; *Bodily Modes of Existence: Politics and Society in the Age of Technology*; *Qualitative Research Methods for News and Data Analysis*; *Tweet Me Up, Scotty: Exploring Contemporary Cybercultures*. The aim is to inculcate technology in programme delivery for better regional and global access, learning outcomes and intellectually engaging experiences. Regular revision of curricula ensures that all the latest developments in discipline literature and practice are fully integrated into the course.

JGU actively promotes an innovative teaching methodology that increasingly employs technology. The blended teaching and learning system enhances the overall learning experience for students. The use of innovative pedagogical tools like digital textbooks, visual thinking, digital and online courses; movie clips and documentaries, use of MoJo (Mobile Journalism), case studies along with collaborative learning through joint digital classrooms, and experiential learning promotes active learning and engages students more effectively. All the teaching is conducted in smart classrooms, fully equipped with state of the art technology.

JGU views knowledge creation as a significant responsibility of a university and prioritizes research for creating wider social impact. It believes in fostering a vibrant research environment to promote cutting edge, interdisciplinary research, especially on social issues. The research carried out by its more than 55 research centres is made accessible to the wider public through web-based platforms, in-house web-based commentaries, webinars, social media, and traditional media.

Innovation and Social Impact

JGU is driven by the desire to have a positive impact on social and community development and contribute to national and global policymaking. JGU has Research Institutes that dedicatedly work on the intersection of innovation and technology, policy, law, economics and societal impact, thus presenting a perfect example of how technology can be blended with humanities to have a positive social impact. Through the Jindal Centre for Social Innovation and Entrepreneurship (JSiE), JGU works on incubating entrepreneurs, building social innovation capacity and using digitized education programmes to expand the knowledge and understanding of social enterprise and ensuring impact. The Jindal Initiative on Research in IP and Competition (JIRICO) at JGU largely works on undertaking cutting edge research and producing high-level deliberation on the topics at the interface of competition policy and innovation. Through the Jindal Institute of Behavioural Sciences (JIBS) JGU propagates fundamental research and innovation on understanding human behaviour by combining the elements of psychology, criminology, victimology, and forensics to study human and social behavior. It has a dedicated forensic lab and psychometric lab to carry out social experiments. The International Institute for Higher Education Research and Capacity Building (IIHed) carries out research studies and offers courses that are based on the intersection of higher education, technology, and policy. The institute also seeks to bridge the gap between school education and higher education by organizing summer schools for high school students modeled after the JGU undergraduate interdisciplinary curriculum and experiential learning pedagogy mediated by the use of classroom technology.

Administrative Integration

JGU has integrated technology in its administrative capacity. As a world-class institution aiming to enhance the student experience, JGU believes in providing state of the art infrastructure infused with the latest technological advancements. JGU has a dedicated IT and Innovation office and has created a special post for 'Chief Innovation Officer'. It has also employed an ERP system to streamline processes in academia, human resourc-

es and general administration of the university. The JGU Global Library and other learning systems provide facilities like e-resources, D-space, remote access, and an online repository of books, journals and multimedia files. The library has facilitated the creation of ORCID IDs for faculty members and has archived research studies by faculty members on D space. JGU has also extensively used technology to secure its campus.

Conclusion

JGU as a university has institutionalized technology and innovation as essential components of its teaching and learning systems. However, as a global university located in a rural space, it is constrained by certain limitations, such as limited supporting infrastructure like roads and transportation, lack of support from the surrounding community, and the difficulty to attract manpower with requisite expertise due to distance from the metropolitan city. Nevertheless, it is relentlessly working to overcome these limitations and pursuing the ultimate goal of achieving excellence in its endeavors as it firmly believes in what Albert Einstein once said, "Human spirit must prevail over technology".

JGU's efforts were recently rewarded when it became the youngest university to break into the QS World University Rankings 2020, being ranked between 751-800 globally, and in the global top 150 out of all universities that are under 50 years of age ranked by QS. It was a major feat for a social sciences, arts and humanities university from India to break into rankings that are dominated by STEM universities, and is testament to the fact that humanities and social sciences universities can successfully create a synthesis between arts and technology without losing their essence. It also highlights that the move towards Education 4.0 in no way undermines the role of arts and humanities. On the contrary, the essential attributes of creativity, critical thinking, communication and collaboration required in the age of Industry 4.0 necessitates that the disciplines of arts, humanities and technology should come together. As Albert Einstein once said, "they all are branches of the same tree".

References

- Begg, M. D., and R. D. Vaughan. (2011). Are biostatistics students prepared to succeed in the era of interdisciplinary science? (and how will we know?). *American Statistician* 65(2):71-79.
- Davies, M, and Devlin, M. (2007). Interdisciplinary higher education: Implications for teaching and learning. Centre for the study of higher education. The University of Melbourne.
- Lariviere, V, and Gingras, Y. (2009). On the Relationship Between Interdisciplinarity and Scientific Impact. *Journal of the American Society for Information Science and Technology*. 61. 10.1002/asi.v61:1.
- National Academies of Sciences, Engineering, and Medicine. (2018). The Integration of the Humanities and Arts with Sciences, Engineering, and Medicine in Higher Education: Branches from the Same Tree. Washington, DC: The National Academies Press. doi: <https://doi.org/10.17226/24988>.
- Puncreobutr, V. (2016). Education 4.0: New Challenge of Learning. *St. Theresa Journal of Humanities and Social Sciences* 2: 92-97
- Ribéreau-Gayon, A. and D'Avray, D. (2018). Interdisciplinary research-based teaching: Advocacy for a change in the higher education paradigm. In Tong V., Standen A., & Sotiriou M. (Eds.), *Shaping Higher Education with Students: Ways to Connect Research and Teaching* (pp. 139-149). London: UCL Press. Retrieved from <http://www.jstor.org/stable/j.ctt21c4tcm.23>
- Squires, G. (1992). Interdisciplinarity in Higher Education in the United Kingdom. *European Journal of Education*, 27(3), 201-210. doi:10.2307/1503449

Case Study — The Universitat Oberta de Catalunya (UOC) and the Universitat Politècnica de Catalunya (UPC) Form an Alliance to Bring Humanities Closer to Technology

Carme Fenoll and Teresa Ferriz

Traditionally there has been little dialogue between the curricula of humanities and technology degrees, but, at a time when science and technology are becoming increasingly more important in society, digital transformation has affected every aspect of our lives and the fourth industrial revolution is a fact, connection and interaction between science and technology and the social sciences and the humanities is vital.

Because they are aware that society needs technology professionals with humanistic values and social science professionals with technological skills, the UOC and the UPC want to face this social challenge by encouraging educational backgrounds in which there is greater interaction between the humanities and science and technology. This joint initiative aims to create mutual recognition pathways to bring UPC technology subjects and UOC humanities subjects closer; the first of these is the master's degree in Philosophy for Contemporary Challenges that the UOC will begin to offer in the next academic year and that will be supervised by the philosopher and professor Marina Garcés.

Additionally, mobility will be promoted between the two institutions: undergraduate students from one university will be able to take subjects at the other and have them recognised as optional subjects on the bachelor's degree at the sending university. The universities will provide pathways for easier and more structured credit recognition. Starting from the 2019-2020 academic year, UPC students on the master's degree in Industrial Engineering will be able to take credits on the master's degree in Philosophy for Contemporary Challenges at the UOC and vice versa.

The universities have been collaborating for years by offering double and triple degrees in several areas of knowledge. The double degrees are the master's degree in Management Engineering (ETSEIB or ESEIAAT) and the master's degree in Organization Management in the Knowledge Economy (UOC), and the master's degree in Industrial Engineering (ETSEIB) and the master's degree in Organization Management in the Knowledge Economy (UOC). The triple degrees are the bachelor's degree in Industrial Technology Engineering (ETSEIB or ESEIAAT), the master's degree in Industrial Engineering (ETSEIB or ESEIAAT) and the bachelor's degree in Business Administration and Management (UOC) or the bachelor's degree in Economics (UOC) for ESEIAAT students, and the bachelor's degree in Aerospace Technology Engineering or the bachelor's degree in Aerospace Vehicle Engineering (ESEIAAT), the master's degree in Aeronautical Engineering (ESEIAAT) and the bachelor's degree in Business Administration and Management or the bachelor's degree in Economics (UOC).

#PremiGabrielFerraté

In the framework of the same agreement, the UPC and the UOC have agreed to create the Rector Gabriel Ferraté Award to promote solutions to contemporary challenges in society. The first edition, to be held in late 2019, will challenge the two university communities to provide a joint response to a growing social problem: emotional loneliness.

In Spain, one in three people feels emotionally lonely, according to a study by la Caixa. It affects people of all

ages: one third (34.3%) of those aged 20 to 39 claim to suffer from emotional loneliness, especially due to a lack of significant relationships, and 26.7% claim to feel social loneliness due to the lack of a sense of belonging to a group. The older people are, the higher the figures: 39.8% of people over 65 feel emotionally lonely and 29.1% socially lonely. It is even worse among people over 80: 48% report emotional loneliness and 34.8% social loneliness. The study also confirms that those with lower levels of education are more likely to feel emotionally lonely because they are more exposed to social isolation. The data show that 37% of people with lower levels of education are likely to feel emotionally lonely, as opposed to just 6.6% of people with higher levels of education. Additionally, it affects men more than women, because women have larger and better quality social networks.

With this award, the universities are seeking greater connection between the university community and Catalonia's social and cultural fabric. A key ally will be the Museu Nacional d'Art de Catalunya (MNAC).

Participants must be hybrid teams of students taking social science, humanities, science and technology degrees. In collaboration with professors, mentors and other members of the UPC and UOC university communities, they will go through the various stages of the challenge by progressively acquiring knowledge of the social sciences, humanities, arts, science and technology and cross-disciplinary skills and competencies such as creativity and communication.

There will be just one winning team and two finalists, but all participants will receive the actual prize, which is working with a highly personalised, challenge-based learning methodology that will contribute to students' personal and professional growth by letting them explore their own capabilities with their colleagues, with the aim of contributing to society and in pursuit of the common good.

With this prize, the universities wish to pay homage to Gabriel Ferraté, who was the rector of the UPC (1972-1976 and 1978-1994) and the founding president of the UOC (1995-2005), on the occasion of the UPC's 50th anniversary and the UOC's 25th anniversary.

Case Study — Planetary Wellbeing, a challenge for the planet and a central UPF project

Josep Lluís Martí

In 2018, Pompeu Fabra University (UPF) launched the Benestar Planetari (Planetary Wellbeing) project, an ambitious programme with which it is seeking to transform its research, teaching and knowledge transfer model. It is unprecedented in the Spanish university system, but follows on from the changes introduced by some of the best universities in the world. The idea is to promote cross-cutting, interdisciplinary approaches to all activities in the field of planetary wellbeing in order to foster an institution that is committed to the tackling the biggest challenges faced by global society in the 21st century, as exemplified by the United Nations Sustainable Development Goals (SDGs), and thereby generate innovative and transformative energy at the university itself and in its surrounding urban environment, namely the city of Barcelona.

The UPF's Benestar Planetari project drew its inspiration from the Planetary Health programme originally devised at Harvard University, by *The Lancet* magazine and by the Rockefeller Foundation, and which currently comprises more than 60 prestigious international research centres, along with an even larger number of NGOs, companies and civilian organizations, in the so-called Planetary Health Alliance.

Both projects are sustained on four powerful, but simple ideas:

1. Human health, well-being and civilization depend heavily on the planet's natural systems and their careful administration. Since the 1950s, natural systems including the atmosphere, the oceans and the climate, among others, are degrading at an unprecedented pace and may in some cases have already reached a point of no return in terms of degradation.
2. The degradation of natural systems is generating environmental threats to human health and well-being and to our civilization as a whole. In such an uncertain situ-

ation, the risks that mankind faces today require urgent and transformative actions to protect present and future generations, as confirmed at the Paris Climate Change Conference (2015).

3. Current systems for the governance and organization of human knowledge are insufficient to cope with these threats to global health and wellbeing. Governance must improve in order to help integrate social, economic and environmental policies and to create, synthesize and apply interdisciplinary knowledge to improve Planetary Health.
4. Solutions are within our reach and must be based on a redefinition of wealth to focus instead on improving our standard of living and achieving better health and well-being for all, together with respect for the integrity of natural systems. This requires societies to address the causes of environmental change by promoting sustainable and equal consumption patterns, reducing population growth and leveraging the power of technology for change.

There is no question that the world's research and knowledge system has not done enough and a qualitative leap is needed. The conditions to make this happen do exist. What we need are universities with firm convictions, sufficiently flexible structures, and ambitious goals on a global scale.

Institutional commitment and collaborative research to devise solutions

In this context, on 15 May 2019, within the framework of the second plenary session of the Planetary Wellbeing project, the UPF issued an institutional statement on

the climate emergency, and which reflects the university's concern about the depletion of the planet's natural resources and its commitment to finding solutions. The event included a conference on planetary health by Howard Frumkin, director of the 'Our Planet, Our Health' programme at the Wellcome Trust of London. The university also approved the first call for research projects on planetary welfare.

This call, offering the sum of 146,000 euros, is based on two fundamental ideas of the Benestar Planetari project. The first is that the generation of new knowledge is the first step towards the implementation of wise policies, with decided actions and inspirational leadership that can respond to these global challenges. The second is that the study of this phenomenon can only be approached in an integrated manner, by combining current knowledge in the fields of health, biology, economics, law, governance, technology and, of course, communication, culture, art and humanities.

The call is thus focused on two goals. On the one hand, support for a new generation of researchers and academics through grants for PhD and postdoc students, not just for research visits and attending congresses, but also to cover the costs of more interdisciplinary research work. On the other, to encourage collaborative, open research on planetary well-being, fostering multidisciplinary and transdisciplinary research and partnership, especially through seed-funding subsidies that might lead to the presentation of bids in international competitive calls. There are also plans to issue grants for holding congresses, workshops, conference seasons, informative debates and internal interdisciplinary groups to work on various aspects of this topic.

The University also set up a series of education actions in 2019. For example, it is creating a minor in Planetary Wellbeing, an additional option open to all undergraduate students. It is also assessing a proposal to create minimum contents and modules on the subject that might end up being compulsory. Specific prizes have also been created for the best end of degree and master's degree projects on the topic, and various activities have been organized to involve the university community and society in general in the project.

In short, the Benestar Planetari project is looking to make Pompeu Fabra University a global institution at the service of the welfare of humankind and the planet. But the challenges supposed by such a commitment cannot be faced alone. We need to work in liaison not just with

the university community but also with the society around us, and also to work with other universities and international organizations. Only if the whole science community works together in a coordinated and collaborative manner will we be able to find the solutions we need to deal with these urgent global challenges. That is why the University is also assuming the responsibility of helping to create an international network of higher education and research institutions that can work together for planetary wellbeing. Because it is only by advancing together towards the frontiers of knowledge that we can successfully tackle the challenges and uncertainties that the future holds.

3. How can the obstacle of the specialisation and sectorisation of 'scientific' and 'humanistic' languages be dealt with in order to overcome the mediation of 'dissemination' and be able to imagine collective and reciprocal work processes?

Overcoming Specialization and Separation of ‘Scientific’ and ‘Humanistic’ Knowledge. The Co-creation of Hybrid Education Programs from Reciprocity and Complexity Understanding

Susanna Tesconi

Abstract

The article explores good practices and key ideas that could inspire the generation of shared educational design processes in higher education from reciprocity, and transformation to overcome specialization and separation of ‘scientific’ and ‘humanistic’ knowledge. With this goal in mind first we discuss, problematize and redefine several issues related to knowledge generation and sharing in higher education, such as the idea of dissemination as opposed to cross-pollination, and the expanded view of epistemological pluralism. Furthermore, we propose a series of strategic recommendations for Higher Education Institutions that can help to deal with the problem of the separation of scientific and humanistic knowledge. The proposed strategies first suggest the establishment of common complex problems and challenges as a starting point for the co-creation of cross-cutting knowledge; secondly, the design of generalist interstudy programs is presented as a way to balance the tendency toward specialization in course and program design. Also, the co-design of ‘generalistic’ programs is seen as an opportunity for faculty to experience co-creation practices as a way of building a mutual understanding and reciprocity in course design. Finally, we present the concept of the education laboratory as space for academic conviviality, co-creation of knowledge and educational experimentation.

Introduction

We are living in a time where huge challenges such as climate change, social injustice and the rise of emergent technological complexity have to be faced from all the possible angles of knowledge. Unfortunately,

the definitions of the research field and the structures of our educational organizations are based on the inherited, dualistic, disciplinary separation between humanistic and techno-scientific knowledge. This epistemological situation reduces the possibilities for constructive dialogue between the two knowledge fields and consequently limits the potential for raising multiple epistemologies and the generation of shared solutions for common problems.

In order to deepen the critical understanding of reality and educate citizens to be aware and able to act for the construction of a more inclusive, sustainable and just society we need to intervene in the organization of education at every level, fostering multifaceted learning opportunities based on the synergies between disciplinary perspectives, practices and languages rather than on disciplinary compartmentalization and the tendency to hyperspecialize.

In the last 15 years, we have witnessed the rise at primary and secondary schools of active, interdisciplinary methodological approaches that are seeking to overcome disciplinary separation in order to offer more meaningful and articulated learning environments based on practical activities, co-creation, and inquiry. In some cases, such as Montessori’s Schools, Decroly Schools, and the Reggio Emilia approach the inspiration came from the progressive active education tradition. In other cases such as DIY, Maker-based activities and STEAM (Science, Technology, Engineering, Art, Mathematics) environments the call for change comes from social movements for the democratization of technological and scientific knowledge, such as Maker Culture, Citizen and Open Science and technological sovereignty that advocate for horizontal, shared and informal approaches to learning and teaching.

On the contrary, Universities and Higher Education organizations in the majority of cases are more reluctant to adopt disruptive educational approaches as they tend to prioritize instrumental content-based and competitive aspects of knowledge acquisition rather than fostering critical thinking, reflective practices, experimentation and co-creation as a way of learning.

Also, they rarely get inspiration for change from “the outside” of the academic context, for instance, from contemporary social movements or powerful educational practices coming from informal contexts, adding to the divide generated by disciplinary separation between formal and non-formal education.

This tendency to separate into hermetic and artificial compartments also influences faculty organization and, consequently, the way departments work, creating a work environment that does not foster co-creation practices and the generation of shared educational design processes among teachers and researchers from different knowledge areas. It also drastically reduces the possibility of building bridges with society, and being “contaminated” by powerful shared practices coming from non-formal or informal educational contexts such as art and cultural centers, libraries, citizen laboratories, media labs, activist spaces, etc.

How can the obstacle of the specialization and separation of ‘scientific’ and ‘humanistic’ languages be overcome in order to surmount the mediation of ‘dissemination’ and be able to imagine group work processes from reciprocity?

In order to answer the question, we need to discuss, problematize and redefine several issues related to knowledge generation and sharing in higher education, beginning with the idea of dissemination as opposed to cross-pollination.

Cross-pollination vs dissemination culture

Dissemination in an academic context is the act of making research results available to a targeted and specialist audience, such as the scientific community, industries, and policymakers, through the use of a specific language and dedicated channels. It is mostly aimed at sharing research results in order for them to be applied to different contexts, and is rarely aimed at sharing processes and practices.

Every disciplinary research field has specifically dedicated channels for dissemination, such as conferences and journals that rarely nurture interchange among disciplines, especially between humanistic and scientific research and teaching practices.

The adoption of dissemination as a mediation form and means of communication has determined the hegemony of an academic culture (i.e. a way of doing and being) that preserves the separation between academic fields by prioritizing mono-directional, non-equal interactions over the co-creation of shared knowledge or the hybridization of languages.

As opposed to dissemination, an academic culture based on intellectual cross-pollination implies more equal communication among the involved individuals and groups. It allows for the sharing and interchange of knowledge, practices, ideas and processes in several directions, and through diverse channels, not just conferences and academic journals.

Furthermore, cross-pollination is not limited to sharing and communication. It implies from the beginning the shared creation of knowledge among disciplines through the inclusion of a wide range of perspectives, methodologies, and contents. As it fosters mutual enrichment, hybridization of practices, methods, and contents allowing multilayering interactions among disciplinary fields and individuals, cross-pollination has great potential as a methodological framework for the design of learning environments in higher education.

Also, an academic culture based on cross-pollination rather than on dissemination has the potential to nurture inclusive environments for knowledge co-creation, where a wide range of epistemologies can interact in synergy, closing the gap between disciplines on the one hand, and fostering mutual enrichment between formal and non-formal education, and between university and society as well, on the other.

As opposed to dissemination, an academic culture based on intellectual cross-pollination implies more equal communication among the involved individuals and groups

The implantation of an academic culture based on cross-pollination requires, among other things, acceptance of the validity of multiple ways of knowing and thinking. It requires a shared view based on epistemological pluralism.

Epistemological pluralism

Epistemological pluralism arises from empirical observations that the complexity of reality cannot be grasped by a single epistemological, theoretical, or investigative approach (Longino 2002), but requires the synergic interaction of multiple ways of knowing and representing knowledge.

From a theoretical perspective, epistemological pluralism is a powerful and clear concept that deepens our understanding of knowledge creation and representation. However, when we come to integrate it in our practice, things can get quite complicated, such as in the field of interdisciplinary research.

As we said before, disciplinary separation has determined the organization of education, and hence the way we think about learning at any level. For this reason, epistemological pluralism has rarely been considered by learning sciences as a priority, with the exception of the Constructionist learning theory (Harel & Papert, 1991). As Turkle and Papert (1990) suggest, we need to promote, from early ages, a new sense of the learner as a thinker, even as an epistemologist, an expert in recognizing and choosing from among varying styles of thoughts and multiple epistemologies in order to build his or her own knowledge.

The practice of epistemological pluralism as a powerful learning strategy enables individuals to navigate fluidly between disciplinary languages, but more importantly, it acts as the cognitive base for an authentic and deep-rooted social construction of knowledge. This not only applies to students but to faculty as well

However, if we aspire to reorganize academic practices within a framework based on epistemological pluralism together with a cognitive perspective we need to have a more integrative understanding of complex social interactions. In particular, as Miller et al. (2008) suggest, we need to focus on the centrality of the commitment to open and deliberate discussion and negotiation of values.

In order to overcome the obstacle of disciplinary separation in academic practices and be able to imagine group work processes from reciprocity, a common set of values and a shared vision have to be built. But how can a shared vision be built between subjects, groups or

institutions that are often competing? On what ground can common values prevail over divergent interests?

Common problems as an encounter between disciplines

As Deleuze (1998) suggests “The encounter between two disciplines doesn’t take place when one begins to reflect on another, but when one discipline realizes that it has to resolve, for itself and by its own means, a problem similar to one confronted by the other.”

So the real ‘dialogue’ between disciplines begins with the mutual acknowledgment of interdependence in order to resolve complex problems whose solution requires the integration of multiple perspectives, languages and methods. The complexity, the urgency and the extent of the problem are key factors for stimulating deep and meaningful interdisciplinary interactions based on complementarity and reciprocity. Such is the case of the set of problems generated by:

1. Environmental and climate issues
2. Scientific and technological changes
3. Cultural aspects of a global and postcolonial world

For instance, an emergent technological issue such as the impact of Artificial Intelligence on every aspect of human activity, from knowledge production to technology design and social organization, requires, in order to be fully understood, simultaneous ways of knowing and representing. The complexity implied is so huge that every disciplinary perspective is needed, and every knowledge language can be used to build multidimensional representations. Other technological phenomena, such as BigData, Biohacking and Technological sovereignty, present potential common meaningful problems of such a nature.

The urgency, the complexity, and the extent implied by these huge challenges are generating an unprecedented situation for Higher Education that today as never before is called upon to reaffirm its role in the construction of a progressive, inclusive society through the education of critical citizens who are able to integrate different perspectives in the interpretation of complex realities.

But how can universities educate critical citizens within a context where the tendency to specialization, especially in technological and scientific studies, inhibits the development of cross-cutting knowledge languages, such as the humanities, that are such a key element in building critical thinking?

‘Generalist’ vs ‘specialist’

Working on common problems permits deep and meaningful interdisciplinary interactions that help to overcome the separation of humanistic and scientific knowledge. But in order to definitively generate an environment for co-creation of knowledge from reciprocity, a mutual understanding of shared languages and backgrounds has to be constructed.

The tendency to specialization in higher education programs is a response to and a way to deal with the economic transformation from a labor-driven economy to a knowledge-driven economy. Markets and industries, especially in the tech sector, are calling for specialized workers, and universities respond by creating specialist programs that can improve the employability of their students.

We envision specialist studies as useful and have a positive view of the effort to improve employability. However, we think that in order to respond to complex social challenges and prepare students for complex professions, universities should build specialist knowledge on the basis of a solid generalist background with a strong cross-cutting presence of the humanities.

A strong generalist background teaches students to understand languages, purposes and perspectives of scientific and humanistic languages and enables them to establish meaningful connections between them. A generalist undergraduate education also helps to build a critical and open view of several knowledge fields and enables students to choose the most appropriate specialization

In particular for complex professions like architecture and design, that have to manage several languages, techniques and practices, the demand for generalist training, combined with further specialization is very high. Also, a generalist background combined with a strong presence of cross-cutting humanities offers the opportunity to train students in emergent forms of experimental art and design that are not taken into consideration by traditional art studies.

The following programs have been selected as good practices in order to respond to the demand for “generalist” training and experimental transversality.

The Bachelor in Architecture at the Academy of Architecture, Università della Svizzera Italiana (Mendrisio, Switzerland)

The course design is based on the premise that the modern-day architect is called upon to develop innovative forms of expertise that will enable them to work on several fronts: from designing a building to modelling a territory, from the reuse of historical heritage to landscape redevelopment, from environmentally sustainable constructions to the aesthetic exercise required by the diverse forms of architecture.

For these purposes, the Academy of Architecture at the Università della Svizzera Italiana has developed an interdisciplinary educational model that goes beyond the traditional specializations and trains ‘generalist’ architects that are well suited to our times. On the Mendrisio campus, practical learning is complementary to the technical-scientific courses covering current issues and humanistic lectures on history, philosophy and sociology.

<http://www.arc.usi.ch/it>

School of New Humanities and Design (Bangalore, India)

The School of New Humanities and Design at the Srishti Institute of Art, Design and Technology foresees humanities as a practice that is not restricted to any particular discipline but strives to transcend disciplinary boundaries and create new connections—impactful efforts towards a more creative, just and sustainable world.

<http://srishti.ac.in/schools/school-of-new-humanities-and-design>

School of Media, Arts and Science (Bangalore, India)

The School of Media, Arts and Sciences is a fertile ground for collaboration and trans-disciplinary practice. Students are engaged in rigorous processes of experimentation, invention, study and expanded use of emerging and DIY technologies.

<http://srishti.ac.in/schools/school-of-media-arts-and-sciences>

Interactive Telecommunications Program (ITP), Tisch School of the Arts, New York University (New York, USA)

ITP is a two-year graduate program at the TSA, which is sometimes described as an art school for engineers and at the same time an engineering school for artists whose mission is to explore the imaginative use of communication technologies.

<https://tisch.nyu.edu/itp/admissions/itp-mps>

Master Program in Interaction design, Malmö University Faculty of Culture and Society at the School of Arts and Communication (Malmö, Sweden)

Based on the acquisition of technical skills for designing interactions, the responsible, sensitive design approach takes issues of ethics and sustainability seriously, and focuses on design with human values in mind and research-based teaching.

<https://edu.mah.se/sv/program/tguide>

Transdisciplinary Design Master in Fine Arts. The New School (New York, USA)

This program was created for designers interested in imagining alternative futures through design-led research tools and methods for addressing pressing social, economic, political, and environmental issues and challenges of local and global dimensions.

Generalist education programs based on the cross-cutting use of diverse knowledge languages are a great opportunity for students to develop a solid background upon which they can build significant expertise. However, they represent a greater opportunity for faculty and institutions to foster dialogue between disciplinary sectors.

Participation in the design of these programs allows faculty and researchers from different departments to experiment and study organizational co-creation practices from within, whereby program design is the breeding ground for educational research and presents an opportunity for experimentation with disruptive educational practices. In other words, it has the potential to become an education laboratory.

<http://sds.parsons.edu/transdesign/seminar/speculative-design-as-education/>

Education laboratory

The idea of education laboratories as spaces for educational design and faculty development is based on three pillars. One pillar is the TDR (Teacher Design Research) paradigm (Bannan-Rithland, 2014), a framework for professional teacher development based on the practice of co-design of learning environments as a strategy for teacher training and research. TDR encourages faculty to activate research processes directly in their professional contexts through the co-design of learning environments, didactic materials and curricula together with other teachers or researchers. Co-design practices provide faculty with opportunities to reflect on the curriculum and environments (Parke & Coble, 1997). Interaction with other teachers, experts and researchers increases the quality of reflection (Borko, 2004), radically improves their learning (Ball & Cohen, 1996; Parke & Coble 1997), and ensures the validity of the devices developed (Penuel, Fishman, Yamaguchi & Gallagher, 2007). Also, because of its collaborative nature, co-design has the potential to fill the gap between teaching and research, thus generating a synergy that helps, on the one hand, to define and solve problems in the context where the teaching takes place and, on the other, allows the generation of the theory needed to cross-pollinate successful practices among diverse disciplinary contexts.

The second pillar is the conception of design by Cross (2001), Latour (2008) and Schön (1987), in other words, a discipline that is at once science and art is simultaneously a creative practice and a research process. Schön, in particular, views professionals as designers who create devices and methods for solving problems. However, he puts the focus more on the definition of the problem than on its solution, making it clear that design is not limited to the use of scientific knowledge for problem-solving. Its value is extended to the creative potential of professionals as critical subjects, and to their tacit knowledge and epistemologies, representing a promise for the construction of a reciprocal understanding among people from different disciplinary fields.

The third pillar is the idea of a community of practice (Wenger, McDermott and Snyder 2002) as a form of knowledge co-creation. As opposed to traditional hierarchic organizations, a community of practice fosters participation rather than directing and organizing under the idea of 'cultivation' of practices. The beneficiary effect of communities depends on agreement and

engagement among its members. Its prosperity can be fostered by hosting institutions that value the created knowledge, and providing flexibility, time and resources so barriers are removed and participation is guaranteed.

The idea of educational laboratories also resonates with the concept of “tools for conviviality” as theorized by Ilich (1973) and with the idea of bricolage in contrast to the analytic Western methodology (Levi-Strauss, 1968). Bricoleurs build theories by assembling and disassembling, by negotiating and renegotiating knowledge and epistemologies.

On these bases, an educational laboratory is a dedicated space where faculty have time to meet, discuss, share and analyze contents and tools and co-create educational practices. It is also an opportunity for the interchange of pedagogical knowledge among different disciplinary departments and a very rich context for educational research and experimentation.

Educational laboratories have great potential for theory production from practice. Having a theoretical and methodological framework that allows the representation of practice-based knowledge production is a key element for the generation and spread of good practices and successful program design.

But the most relevant benefit of co-creation in a laboratory is the productive encounter between disciplines and individuals together with the continuous need for negotiation and renegotiation of concepts and epistemologies that ensure the equally significant participation of every actor.

Learning from non-formal education

The way of working described in the previous section is not so common at universities, with the exception of some branches of interdisciplinary research. On the contrary, co-creation practices are common among activist collectives and community and cultural centers aimed at providing access to all branches of knowledge. For this reason, Higher Education Institutions should establish stable collaboration with these informal contexts in order to understand the nature of these practices and learn how to generate similar spaces or create connections between formal programs and informal practices.

The experience of MediaLAB_Prado (Madrid, Spain) provides several examples of cross-cutting open co-creation platforms such as Interactivos?; Ditos: Doing it Together Science; and Collective Intelligence for Democracy.

Interactivos? MediaLAB Prado (Madrid, Spain)

Interactivos? is a research and production platform whose main goal is to expand the use of open hardware and software tools by artists, designers and educators, thus contributing to local community development through the co-design of critical prototypes in interdisciplinary working groups formed in general by artists, educators, engineers, musicians, coders, designers and architects.

The connection between groups is based on their shared interest in open (hardware/software) projects. The programme allows participants to conduct research on the meaning of interactivity, from a philosophical, technological and social point of view.

<https://www.medialab-prado.es/en/programs/interactivos>

Ditos: Doing it Together Science, MediaLAB Prado (Madrid, Spain)

DITOs is a pan-European network supported by the European Horizon 2020 program whose goal is to foster citizen participation in science through a series of activities around two topics: environmental sustainability and biodesign. Medialab Prado leads the work package on environmental sustainability.

<https://www.medialab-prado.es/en/programs/ditos-doing-it-together-science>

Collective Intelligence for Democracy, MediaLAB Prado (Madrid, Spain)

Collective Intelligence for Democracy involves a multidisciplinary team in creating prototypes to activate collective intelligence, improving democracy and citizen commitment.

<https://www.medialab-prado.es/en/programs/collective-intelligence-democracy>

Recommendations

On the basis of the key ideas explored in the previous sections and with the goal of overcoming the obstacle of disciplinary separation, we summarize a set of recommendations as listed below.

- Higher Education Institutions should advocate for and foster an academic culture based on intellectual cross-pollination rather than dissemination in order to produce fertile ground on which transdisciplinary synergies can be cultivated through research and integrated in teaching and program design.
- A cross-pollination culture should also be the base for the pedagogical approach adopted in course design, advocating for constructivist views of learning as the basis for a new sense of the learner as an epistemologist who starts from multiple epistemologies in order to build his or her own knowledge.
- University organization, and its division into disciplinary departments and separate workgroups, can be a huge limitation for faculty collaboration. The complete structural overhaul of secular institutions can be a hard task, so in order to produce some organizational flexibility, and activate collaboration among different areas, the design and implementation of interstudy programs seems to be a sustainable option that implies a reasonable amount of effort.
- As we have seen, the design of generalist interstudy programs can be the starting point for the creation of a more stable co-creation platform for faculty such as an educational laboratory in the form of a community of practice. Once this has been created, and in order to prosper, the community needs to be nurtured by the host institution by providing resources, ensuring participation by giving dedicated time to faculty and sharing the co-created knowledge as a valuable asset.

spective and include an integrative understanding of complex social interactions. In other words, we need to focus on the centrality of the commitment to open discussion and negotiation of values.

- The urgency, the complexity, and the extent implied by current social and environmental issues are challenging Higher Education Institutions to re-assume a central role in the construction of a sustainable and inclusive society through the education of critical citizens.
- The tendency to specialization in curriculum and program design, especially in technological and scientific studies, is a limitation for the development of cross-cutting knowledge languages, such as humanities, that are a key element for building critical thinking.
- Specialist studies can be a useful strategy to improve employability. However, in order to respond to complex social challenges and train students for complex professions, a solid generalist background with a strong cross-cutting presence of the humanities seems to be a better solution. Also, the design of generalist interstudy programs implies the horizontal collaboration of faculty together with departments that provide the opportunity for constructive encounters between disciplines and individuals to negotiate concepts and epistemologies and thus ensure the equally significant participation of every actor.

Conclusions and final comments

- The implantation of an academic culture based on cross-pollination requires acceptance of epistemological pluralism and its integration in the pedagogical approach. However, if we aspire to reorganize academic practices within a framework based on epistemological pluralism we need to go beyond the cognitive per-

References

- Ball, D. L. & Cohen, D. K. (1996). Reform by the book: What is—or might be—the role of curriculum materials in teacher learning and instructional reform?. *Educational researcher*, 25(9), pp. 6-14.
- Bannan-Ritland, B. (2014). Teacher design research: An emerging paradigm for teachers' professional development. In *Handbook of design research methods in education* (pp. 264-280). Routledge.
- Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational researcher*, 33(8), pp. 3-15.
- Cross, N. (2001). Designerly ways of knowing: Design discipline versus design science. *Design issues*, 17(3), pp. 49-55.
- Deleuze, G. (1998). The Brain Is a Screen. *Discourse: Journal for Theoretical Studies in Media and Culture*, 20(3), p. 9.

Harel, I. E. & Papert, S. E. (1991). *Constructionism*. Ablex Publishing.

Latour, B. (2008). A cautious Prometheus? A few steps toward a philosophy of design (with special attention to Peter Sloterdijk). In *Proceedings of the 2008 annual international conference of the design history society* (pp. 2-10).

Longino, H. E. (2002). *The fate of knowledge*. Princeton University Press.

Illich, I. (1973). *Tools for conviviality*. London: Marion Boyars.

Levi-Strauss, C. (1968). *The savage mind*. Chicago: University of Chicago Press.

Miller, T. R. Baird, T. D., Littlefield, C. M., Kofinas, G., Chapin III, F. S., & Redman, C. L. (2008). Epistemological pluralism: reorganizing interdisciplinary research. *Ecology & Society*.

Parke, H. M. & Coble, C. R. (1997). Teachers designing curriculum as professional development: A model for transformational science teaching. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, 34(8), pp. 773-789.

Penuel, W. R., Fishman, B. J., Yamaguchi, R. & Gallagher, L. P. (2007). What makes professional development effective? Strategies that foster curriculum implementation. *American educational research journal*, 44(4), pp. 921-958.

Schön, D. A. (1987). *Educating the reflective practitioner*.

Turkle, S. & Papert, S. (1990). Epistemological pluralism: Styles and voices within the computer culture. *Signs: Journal of women in culture and society*, 16(1), pp. 128-157.

Wenger, E., McDermott, R. A. & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Harvard Business Press.

Case Study — Experience of Collaborative Work between Students of Health Sciences and Media Communication

María Laura Cuffí, M. Ángeles García, Jaume-Elies Vilaseca

Introduction

We present a pioneering Service-learning experience at the University of Barcelona, with excellent results as an educational and social transformational tool, since it integrates the learning of academic contents with the university's service to society.

This experience comes from an approach whereby students return the benefit that society is offering them during their training. We are talking about the society of the 21st Century, with Sustainable Development Goals defined by UNESCO that entail, among other elements, minimizing the inappropriate use of medicines in developed countries. Even with the widespread availability of new drugs and the best qualified professionals, therapeutic results are not always as expected. Poor therapeutic adherence leads to a waste of scientific knowledge and public health system resources. Our aim is to encourage responsible use of the most prescribed drugs through audiovisual pieces prepared for dissemination in medical centers and social networks, in order to alert the local population to the importance of achieving good therapeutic compliance and thus reducing public healthcare costs.

But it is not easy to have an impact on society to bring about change. Scientific knowledge in itself is not enough. Technical means are essential to establishing communication between the scientific community and the target population. It is also necessary to determine the type of communication to be established in a society that today handles the languages of image, sound and speech. Thus, the requirement for collaborative and interdisciplinary work between students and academics in three areas: Science (Medicine, Podiatry, Odontology), Technology (Media Communication) and Humanities (Linguistics), gathered in two faculties (Medicine and Health Science and Information and Media Communication).

Medicine and Health Science students first investigate the factors of noncompliance with a pharmacological treatment for a specific indication, and then prepare an action plan and prioritize the recipients. Once the Media Communication students have understood the medical objectives, they propose an audiovisual genre, a format and treatment, and finally look for references. Two projects have been developed so far: *Antibiotics: responsible consumption*, in the form of three audiovisual capsules inspired by police fiction; and *Put your foot down: disclosure of the treatment of neuropathic ulcers in diabetics*, an animated film aimed at diabetic patients aged over 55 years.

Challenges

Interdisciplinary work means situating ourselves in the 21st Century. This is not easy because there is no academic tradition at university, or any infrastructure that promotes contact between undergraduate students and professors from different faculties and gets them to work together on social impact projects. We should also note that these students are evaluated and receive a grade for the subjects they study and that we have involved in the projects. So, it was necessary to devise a joint evaluation rubric for students from both faculties, in awareness that we were crossing the boundaries for the teaching-learning of conventional subjects.

In this sense, the work on each project had strict deadlines as set by the subjects to cover an academic year, so the time frame had to be planned accurately. And since its inception, not only was technical and communicative excellence sought, but also excellence in scientific research on the ground, which had to be refined so as not to err in the action plan: we had to devise data collection tools, analyze them and hierar-

chize them, before focusing on the communicative objective and producing the audiovisual piece. The students were in training, so the tutoring was very intense in order to achieve a well-made and socially acceptable audiovisual product. So, these projects can only involve 10 students per academic year. Likewise, we had to look for physical spaces to hold meetings; the commute between faculties has a cost in time and in money that the institution does not contribute to. There was also a lack of financial resources to obtain specialized technical tools with which to produce professional-quality audiovisual works, as well as for the students to present their experience at congresses.

Finally, it was also a challenge to communicate between people from such widely varying areas of knowledge and academic traditions, with such different languages of specialty. However, we all share the great challenge of continuing to foster this initiative.

They also develop high-level professional skills. They identify health problems; seek solutions; develop strategies to communicate scientific subjects in a language style that is appropriate to the subject and audience; select (pre)production techniques that are appropriate to the chosen audiovisual discourse and that best fit the targeted sector and population; make audiovisual and multimedia products; work as a team; and adapt to time, financial and academic imperatives. In short, they become entrepreneurial, creative, negotiating students, who make decisions, learn significantly and feel they are helping to change society.

Added Value

Although the University of Barcelona is committed to transferring the scientific knowledge it generates through Service-learning experiences, there is currently no tradition of this type of practice in which students' learning focuses on a project in which they decide what they want to do and how far they want to go.

The difficulties have not prevented this experience from being highly satisfactory. Students and professors work in a horizontal manner, and this increases the degree of involvement of students (and professors) in their learning process, especially because they also feel that their work has a social impact and that they are enriched by jointly exploring the scientific, technological and humanistic fields. In addition, the chance to describe their experience at international forums and receive academic and social recognition motivated them to encourage new students to get involved in these projects and even to collaborate with professors in their tutoring. Students see the university in 360 degrees: management, research, teaching-learning, teaching innovation, dissemination and knowledge transfer.

Case Study — The Interdisciplinarity of Music Research: The Perspective of the Music Technology Group of the UPF

Xavier Serra

Music is a complex human phenomenon that can be approached and studied from many perspectives. So it is essentially a multidisciplinary object of study. However, given that most education and research institutions are organized around traditional academic disciplines, the interdisciplinary study of music poses huge academic challenges.

In most European countries the practice of music, and hence the study of music making, is taught in Conservatories, while the study of the music phenomenon happens at universities scattered over different departments or faculties. It is different in the UK, the USA, and in countries that also follow the Anglo-Saxon education model. In these countries, music is an academic discipline present in most universities with its own music faculty, thus making it somewhat easier to develop interdisciplinary approaches to music education and research.

Each academic discipline is defined by the corresponding university faculties, by learned societies, and by the journals in which the practitioners publish their research results. Each discipline tends to converge to a common practice, based on favoring specific research methodologies and defining the criteria with which to assess the work done within it. This is a dynamic process that evolves in time, but at any given moment there is general agreement on what the relevant topics to work on and the proper ways to tackle them are.

There are music-focused disciplines within practically all fields of knowledge. The most traditional and broadest research discipline is Musicology, whose origin is in the humanities but that has evolved to include sub-disciplines covering methodologies and objectives from a variety of fields. Examples of subdisciplines include Historical Musicology, Ethnomusicology, Systematic Musicology, and Computational Musicology. Within the natural sciences, Music Cognition emerged

as a discipline to study the brain-based mechanisms involved in the cognitive processes underlying music. Within physics, Musical Acoustics has a long tradition of studying music-producing instruments. Music Education has also developed its own research personality. A more recent discipline is Sound and Music Computing, which studies music from a computer science perspective. Somewhat different are the research approaches within the practice-based topics. Music Composition, Music Theory and Electronic Music have active research communities and the research around music performance has also emerged as an academic discipline in its own right.

The biggest disciplinary challenge in music relates to practice-based research approaches, i.e. when a creative artefact is the basis of the contribution to knowledge, which is the case in areas like composition or performance. In countries like the UK, practice-based research is well recognized by the different established academic organizations and research assessment processes, but most countries are far from this situation.

At the Music Technology Group of the Universitat Pompeu Fabra in Barcelona⁽¹⁾ we carry out interdisciplinary research in music from the constraints and opportunities that our context gives us. Our case can be used as an example from which to learn about some of the challenges that this type of research faces.

1. <https://www.upf.edu/web/mtg>

Origins and context of the MTG

The MTG was created in 1994 in the context of a research institute of the UPF dedicated to Digital Media and affiliated to its Department of Communication. Then, when several engineering degrees were started in 1999 and the Department of Information and Communication Technologies was created, the MTG moved to this new department. In parallel, the MTG has always been closely connected to a cultural organization dedicated to Electronic Music, Phonos⁽²⁾, and has been collaborating with a music conservatory, Esmuc⁽³⁾. These basic facts give an idea of the interdisciplinary nature of the MTG.

Being in an engineering department forces us to emphasize the disciplinary personality of engineering. To support our interdisciplinary nature, we established and maintain collaborations with institutions and research centers from other disciplines. The UPF and our department are quite open and supportive of these collaborations, hence we have been able to preserve our interdisciplinary nature.

The faculty, researchers and students working at the MTG come from diverse origins and backgrounds. Typically, they have major computer science training and some musical expertise, but also have experience in other fields. They have all joined the MTG because they love music and most of them maintain an active musical practice outside their academic work.

Within our engineering context, the research we do pertains to computer science topics such as signal processing, machine learning, human computer interaction and software engineering. Within these, we explore new approaches and methodologies that can work best for sound and music signals and applications. Then, in collaboration with our partners, we combine our core engineering expertise with topics such as cognition, musicology, composition, education and acoustics.

Within this disciplinary context and from these research approaches, the MTG is able to be active in quite a number of interdisciplinary research topics while contributing to a wide variety of social and industrial needs.

2. <https://www.upf.edu/web/phonos>

3. <http://www.esmuc.cat/>

Research and activities of the MTG

The MTG aims to contribute to the improvement of the information and communication technologies related to sound and music, carrying out competitive research at the international level and at the same time transferring its results to society. To that end, the MTG aims to strike a balance between basic and applied research while promoting interdisciplinary approaches that incorporate knowledge and methodologies from both scientific/technological and humanistic/artistic disciplines.

From the way we think about music research and higher education, we have developed an ecosystem within which we can educate future professionals in the field and have a social impact on the process. Apart from the education programs in which we are involved and the research projects we carry out, we are very active in cultural and social initiatives that are closely tied to our academic activities. Phonos gives us the chance to be active in cultural and artistic initiatives, accessing funds for them and collaborating with organizations outside the traditional academic context. The Esmuc gives us the collaboration with the practice-based context that is not present at the university, mainly music composition and performance.

To help understand the interdisciplinary nature of our research, I shall present two broad examples of research topics that we are working on.

Computational music analysis underlies most of our research. We study and process music signals to develop technologies for specific applications. We analyze audio recordings of different music repertoires in order to identify their musical characteristics. For example, we aim to automatically describe the melodic, rhythmic, or harmonic characteristics of a musical piece or repertoire, extracting musical features with which we can compare pieces and organize large music collections in accordance with them. In order to carry out this type of research, signal processing and machine learning techniques are combined with musicological and music theory approaches. The resulting technologies can be of use for developing music recommendations or music education systems.

Musical interfaces are another broad research topic within which we design and develop interfaces for music making. We study traditional musical instruments

from an interaction perspective and develop computer interfaces that can be used to make music in different contexts and for different applications. This is a highly interdisciplinary topic that can cover many technical and scientific disciplines together with practice-based music topics. We seek to build musical instruments with which people can express themselves.

Conclusions

The interdisciplinary nature of music research requires organizations that can cross disciplinary boundaries. That is not easy because of the way that most higher education institutions are structured. In the Music Technology Group at Universitat Pompeu Fabra in Barcelona we have been able to get around this by developing an ecosystem in which we can join forces with researchers from different disciplines, working together and carrying out projects collaboratively.

However, the context of the MTG is still not ideal for taking advantage of the full potential of music research. A better institutional context could be developed by joining several research groups from different disciplinary contexts, thus establishing a unified framework in which a variety of disciplines would hold the same weight and for which there would be specific funding to promote multidisciplinary and interdisciplinary projects. This is a worthy initiative to push for, both for the benefit of music and our society.

Part 2

Knowledge Society

4. The current knowledge paradigm is based on Western ideals and has been exported all over the world with little regard for cultural diversity, which has been integrated into the idea of multiculturalism. How can we shift from multiculturalism to true epistemological diversity?

Towards Epistemological Plurality in Education across the Global South

Chika Ezeanya-Esiobu

Abstract

The quest to catch up with the Global North's perceived level of technological advancement has resulted in repudiation of the epistemology of knowledge indigenous to many communities and nations in the Global South. This paper makes a case for a reorientation of individuals, community organizers, influencers, researchers and policy makers regarding the need for epistemological pluralism rather than the presently fashionable pursuit of epistemological singularity. One way this can be achieved is through increased emphasis on the humanities and arts, not as disciplines designed to prepare graduates for the job market, but as a mainstreamed part of every course and every discipline in education, with the aim of making human beings out of learners, humans who can understand, embrace and empathize life and its reality; and individuals who can intuitively and creatively predict and respond to challenges at both the micro and macro level. Another way of achieving epistemological plurality is through the empowerment of hitherto neglected indigenous languages across the academic community. Furthermore, validation and strengthening of the intellectual content of indigenous knowledge, usually housed in indigenous languages, will bring about inclusivity of thoughts and ideas held by indigenous peoples, who are known to still connect strongly, in many instances, to the idea of humanity and humanness.

Key Ideas

- The quest for scientific and technological advancement by the Global South has assumed desperate dimensions in the present era owing to the advanced information age and the predictions of even more complex advancements in the form of, for instance, artificial intelligence.
- What is often forgotten is that the Global North did not achieve its present level of advancement by focusing on science, technology and the job market. In the years preceding and following the industrial revolution, it was a "community that deeply valued the humanities and the arts."
- An emphasis on the job market cannot draw out the depths of the human mind and what it is capable of achieving, neither can it lead to the appropriate dissection of the present, emerging and future challenges that humanity faces and will face in the coming years.
- Jobs come and go, markets change and are re-invented, but the human community and what makes humanity thrive remains unchanged and is ever in need of advancement, and this situation is obtainable across cultures and climes.
- Educating the mind with a narrow focus on the job market will not draw out the richness and complexity that is the human mind.
- There is paucity of critical indigenous knowledge-based epistemology of relationality in the market-driven, science and technology focused education that governs the Global North, which the Global South is imitating unchecked and unhindered for the most part.

Introduction

In the study of knowledge and in understanding the processes involved in how we come to know what we know, the influence of the environment and the specific realities of the learner should play a crucial role in the formation of the basics of what is understood to be knowledge within any locale. However, this self-evident nature of the role of the environment in epistemology has not been given its valuable position in the packaging and dissemination of knowledge in present times. Education in many parts of the Global South increasingly appears to be a race to catch up with the West's level of technological advancement and perceived economic development. In this instance, what is previously understood to be education, the epistemology of education in much of the Global South, which has already undergone fundamental transformations in favor of the Global North's epistemology, is now facing complete extinction.

The role of the environment in epistemology has not been given its valuable position in the packaging and dissemination of knowledge in present times

The erasure of any reference to non-western epistemology, if previously pushed by the West and its agencies mainly through religion, colonialism, Cold War politics and development aid, is now largely championed by governments and citizens of the Global South. The quest for scientific and technological advancement has assumed desperate dimensions in the present era owing to the advanced information age in which the world finds itself, and the predictions of even more complex and technical advancements, in the form of, for instance, artificial intelligence. What can the Global South do but keep playing catch-up, hoping against hope as it has done for decades that by somehow focusing more energy on science and technology, especially through the hallowed halls of the education system, that it will eventually be competing on level terms? This assumption by the Global South has led to the present drive and emphasis on science, technology and the ever-changing, even erratic, job market in the creation of knowledge and what is valued as knowledge.

However, the Global North did not reach its present level of advancement by focusing on science, technology and the job market. In the years preceding the industrial revolution, it was a “community that deeply valued the humanities and the arts.” It was in the major appreciation of the potentials of the human person and the desire to understand, in order to better the human environment that the level of science and technology, often associated with the Global North, was born.

Another fundamental point is that the Global North’s advancement came about as a result of the quest to understand its own environment, and not of trying to understand, say, the Global South’s environment. This contrasts sharply with the present tide in the Global South where the emphasis seems to be on the assimilation of knowledge that is generated, processed and pre-packaged in the Global North. In sectors across the whole world, both in the Global North and the Global South, there is a need for much advancement; for the Global South to make a unique contribution to addressing global challenges, it is important for it to retain the epistemological plurality of its various communities and nationalities. It is important for the Global South to be careful to ensure that its various distinct and unique ways of understanding life and knowledge are main-

tained. This is in addition to whatever the Global South can learn from the epistemology of the Global North. The point of view expressed here is that this retention of epistemological plurality can be achieved in several ways, some which have been outlined here, which include; A shift from a market-driven to a human-driven approach to education, a revalorization of indigenous languages in formal education, an equal emphasis on the arts and humanities, as much as on STEM education. We now turn to the enumerated points.

For the Global South to make a unique contribution to the addressing of global challenges, it is important for it to retain the epistemological plurality of its various communities and nationalities

From Market Driven to Human Driven Education

From ancient times until the very recent global boom in neoliberal ideology, education has been viewed as a public asset, a necessity for ensuring the continuity and advancement of the species and the community. Except for cases of severe health challenges, every child follows a natural process of education in order to be well assimilated and to contribute meaningfully to societal goals and aspirations. In the present age, however, education has been reduced to “the attainment of professional specialized skills that cater to the needs of the business world” (Sage and Polychroniou 2016). This market driven approach to education, with an emphasis on competition, privatization and profit-making, has undermined education for wholeness, for human and national advancement. Decrying this situation, Noam Chomsky notes that an emphasis on market driven education implies, “for example, [that] the Classics Department at Oxford [University] will have to prove that it can sell itself on the market. If there is no market demand, why should people study and investigate classical Greek literature? (Chomsky 2016).” An emphasis on the job market cannot draw out the depths of the human mind and what it is capable of achieving,

neither can it lead to the appropriate dissection of the present, emerging and future challenges that humanity faces and will face in the coming years. Mizuko Ito captures this succinctly in noting that, “rather than assuming that education is primarily about preparing graduates for jobs and careers, what would it mean to think of education as a process of guiding kids’ participation in public life, more generally a public life that includes social, recreational and civic engagement” (MacArthur Foundation 2008).

Further, the so-called job market for which the education system presently focuses on is fluid, even erratic. Current research into artificial intelligence, for instance, at the least promises to drastically alter the job market in ways that are still uncertain today; writing in 1996, Jennifer James noted that “it has been estimated that 80 percent of the jobs available in the United States within 20 years will be cerebral and only 30 percent manual, the exact opposite of the ratio in 1900. A quadriplegic with good technical and communication skills is becoming a more valuable worker than an able-bodied person without those skills... Minds will be preferred over muscle (James 1996).” While James’ prediction has not come to pass in its entirety, there is still trepidation that AI and automation will transform the future of labor in ways that will impact hundreds of millions of workers. Indeed, jobs come and go, markets change and are re-invented, but the human community and what makes humanity thrive remains unchanged and is ever in need of advancement, and this situation occurs across cultures and climes. Human challenges evolve and all that is needed to resolve them are human sensitivity, and an open, optimistic, enlightened, caring and determined mind.

As stated earlier, the foundations of education that developed the west were not built on a market-driven epistemology, but on human and community responsiveness. There is a need for the Global South to take steps to rediscover education as a determinant factor in the direction of the human mind and society, and to stand its ground on the truth that a solid education cannot be built on a factor as fluid, inconsistent, unstable, and even shallow, as the market; since markets rise and fall, should the human person and the advancement of mankind also rise and fall with the market? It is important to rearticulate formal education not as a mere path to economic prosperity or technological advancement, but as a necessity for living a good life and contributing to societal advancement. Educating the mind with a narrow focus on the job market will not draw out the

richness and complexity that is the human mind.

From STEM to STEAM

Globally, there is increasing emphasis on science and technology as the yardstick of advancement, coupled with a decreasing appreciation of the role of humanities and arts in advancing societal ideals. This has been followed by the playing down – even outright denigration, in certain quarters - of societal ideals in favor of ideals prevalent in the part of the world with the most advanced scientific and technological know-how. The emphasis on STEM (science, technology, engineering, and mathematics), and the market driven creation of courses has robbed recipients of education as a strong and tangible purpose for being alive. The purpose of life has become the acquisition of wealth by way of well-paying jobs, a concept that psychologists across the globe are unanimous in agreeing, is shallow and does not offer deep-felt and lasting fulfillment for the human person (Markman 2018).

What we find is an increasingly dissatisfied populace whose embers of discontentment are fanned by the deceptive and hurried stance of the neo-information age. The tide of the times with a focus on the creation of material wealth as the gourd of happiness appears to have advanced so forcefully, presenting itself as the sole path to success, with no other alternative, that voices calling for the epistemology that educates the whole human person now tether on the periphery. The global emphasis on STEM education often assumes an either/or stance where often limited education funds are directed towards STEM, while the humanities and arts are left to die, or at best maintain some form of skeletal existence. The United States in the Global North appears to have, in many instances, relegated the study of the arts and humanities to an optional, even unnecessary, part of formal education. The United States National Center for Education Statistics notes that close to 1.5 million pupils study no music, nearly 4 million learn nothing about the visual arts, and over 23 million are being educated without dance or theater on the curriculum. In the United States, the Department of Education (DoE) Common Core Standards, which is a sort of one-size-fits-all approach to education, emphasizes STEM subjects as the focal point for education, well ahead of the arts and humanities (Adamson 2019). The former Governor of Florida, Rick Scott, was quoted

as saying in an interview that he wants to spend government “money getting people science, technology, engineering and math degrees. That’s what our kids need to focus all of their time and attention on: those types of degrees that when they get out of school, they can get a job” (Adamson 2019).

However, education in humanities, arts, science and technology are all necessary for societal advancement. Bearing in mind that STEM promotes rote memorization, a process that can pose a hindrance to a student’s ability to explore his/her own mind and independently analyze and fuse subjects, the social sciences and the arts provide this missing link whereby students are encouraged to delve into the nature of concepts, unpack issues and explore solutions rather than merely accept solutions (Adamson 2019). “It is using the combination of all these capabilities that drives creativity and innovation,” says Karl Eikenberry of the Stanford Center for International Security and Cooperation. “The future economic cost of not having a whole brain education system that fosters creativity and innovation is immense. It requires retraining instructors to teach how to deal with ambiguities and nuances – how to think creatively and how to construct or deal with abstract issues instead of so much of the emphasis being on teaching facts. Teachers will need to teach our students to ‘think’ – not memorize” (Adamson 2019). Such firm grounding in the arts and humanities builds character, discipline and critical consciousness. Training in the social sciences enables beneficiaries to deeply attach meaning to the purposes of life, and to understand reality, while pursuing an ideal state, thereby leading to perseverance in pursuit of solutions for personal and community challenges. Countries in the Global South must give equal priority to both the social sciences and arts on the one hand, and to STEM education on the other. Neither must be regarded as a bigger priority than the other.

tionships bring about interdependencies (Antoine et al. 2019).” The nature of human relationships and the interconnectedness they foster calls for utmost respect, and no superiority, scorn or oppression of any sort. This worldview is antithetical to environmental degradation, segregation or any form of superiority towards fellow mortals, and the respect for what is not known. There is a paucity of this epistemology in the market-driven, science and technology focused education that governs the Global North, which the Global South is imitating unchecked and unhindered for the most part.

Furthermore, indigenous epistemologies extol the principle of holism, a holistic approach to understanding issues and concepts. Indigenous epistemology values being over doing, and wholeness over the narrow pursuit of a singular issue for personal gain or profit, or the pursuit of the success of a separate part even if it is to the detriment of the whole. “Human development and wellbeing involve attending to and valuing” all realms (Antoine et al. 2019). It is crucial for the countries of the Global South to integrate, even mainstream, indigenous epistemologies in course goals, learning outcomes, learning activities, assessments, relationships, and format.

Related to indigenous knowledge, epistemology is the question of the language of instruction across the education system in the Global South. Indigenous languages have been aptly referred to as “verbal botanics” since they “carry within them a wealth of knowledge about the local ecosystem.” Indigenous languages also act as a “repository of a polity’s history, traditions, arts and ideas such that, “when a language is lost, much of the wealth of knowledge it embodies is also lost.” The language of formal education in the Global South must be inclusive of all indigenous languages in order to gain from the wealth of knowledge possessed within these languages.

Indigenous Knowledge Based Epistemology

There is need for the Global South to improve the understanding of indigenous epistemologies within the communities that make up its regions. Indigenous epistemologies value relationality, the belief that all human beings are “related to each other, to the natural environment, and to the spiritual world, and these rela-

Conclusion

Unchecked and untackled, the Global South is gradually slipping into a state of singularity regarding education epistemology in relation to the Global North. This is happening due to emphasis on the job market fashioning the education curriculum, and the promotion of STEM education and the repudiation of arts, humanities and social sciences. There is need for indigenous knowledge-based epistemology to be emphasized, as well as the use of indigenous languages in teaching and research.

Integration of Indigenous Epistemologies in Curriculum Design and Development

Goals

Courses should include the holistic development of the learner and be locally beneficial.

Learning outcomes

Learning outcomes should emphasize cognitive, emotional, physical and spiritual development. There should be adequate provisions made for individual learning goals, and for personal development.

Learning activities

Learning activities should be “land-based, narrative, intergenerational, relational, experiential, and/or multimodal (rely on auditory, visual, physical, or tactile modes of learning).”

Assessment

Assessment should be holistic in nature and include “opportunities for self-assessment that allow students to reflect on their own development.”

Relationship

Opportunities should be created for learning in the community, intergenerational learning, and learning in relationship to the land.”

Format

Courses should include learning beyond the classroom “walls” (Adapted from Antoine et al. 2019).

References

Adamson, Joni /2019). Oh The Humanities! Why STEM shouldn't take Precedence over the Arts, *Project Humanities: Arizona State University*. URL: <https://projecthumanities.asu.edu/content/oh-humanities-why-stem-shouldnt-take-precedence-over-arts> (accessed February 24, 2019).

Antoine, A., Mason, R., Palahicky, S. and C. Rodriguez de France. (2019). Pulling Together: A Guide for Curriculum Developers, Open Text University of British Columbia. URL: www.opentextbc.ca/indigenizationcurriculumdevelopers/via@pressbooks (accessed February 24, 2019).

Chomsky, Noam, interview by Lily Sage and C.J. Polychroniou. *Noam Chomsky on the Perils of Market-Driven Education* (October 22, 2016).

James, Jennifer. (1996). *Thinking in the Future Tense*. New York: Touchstone.

MacArthur Foundation (2008) *Living and Learning with New Media: Summary of Findings from the Digital Youth Project*. Chicago: The MacArthur Foundation.

Markman, Art. (2018). Money, Happiness, and Socioeconomic Status, *Psychology Today*. URL: www.psychologytoday.com (accessed February 24, 2019).

Pihama, L. (1999). APEC: Colonial Manipulations. *The Bog Picture*, GATT Watchdog, 19, November, pp. 4-6.

Sage, L, and C.J. Polychroniou. (2016). Noam Chomsky on the Perils of Market-Driven Education, *Truthout.org* (accessed February 24, 2019).

On the Dynamics of Languages of Science: Lessons and Challenges for Higher Education Policies

F. Xavier Vila

Abstract

Universities are in the midst of a revolutionary change fuelled by such forces as internationalization, public underfunding and commodification of knowledge and education. One of the fields affected by these transformations is that of language practices, and some even describe English as the new Latin of the contemporary world. But things are never that simple. In this article, we will look at historical developments in HE in order to understand more adequately the many complexities of contemporary challenges in the field of language management, and we will argue that these complexities demand a plurilingual solution rather than a monolingual one.

The construction of languages of specialized knowledge

The story has been repeated several times over history, in China, India, Persia, the Middle East and other regions. Thanks to the combination of different factors, which often include political and military hegemony, a given civilization has produced a standard language that has become a lingua franca, i.e., the means of communication among speakers of different languages, as well as the indispensable grease to keep the mechanisms of a powerful administration moving (Ostler 2010). In time, this language has become the vehicle of a significant corpus of sophisticated knowledge, embracing scientific, religious, technological and humanistic works of both practical and symbolic value. Thanks to its standardized nature, this language has reduced language change and made this precious knowledge available to successive generations. Little by little, though, and due precisely to its stable nature, the language of wisdom has progressively diverged from the ever-changing

common parlance of the people to eventually become a second language even for the great grand-children of those who standardized it. As such, it has transformed into a social barrier preserving specialised science and wisdom for elites who can invest time and money in learning it. In short, if not managed adequately, languages of specialized knowledge may transcend time and space and work as a lingua franca for elites, but at the same time lead to the relegation of those who do not master it.

This paradoxical process whereby a language may end up playing contradictory social roles is well exemplified by the history of Latin (Waquet 2001). Centuries before the Common Era, the language of the nascent Roman Empire was standardized and became the vehicle of formidable cultural life. Latin spread with the Empire, to the extent that by the early first millennium, it had become the most convenient tool to disseminate Christianity to the masses of ample regions of Western Europe. After the dissolution of the Western Roman Empire, and for more than one millennium, Latin functioned as a refuge for science and the arts. But as common parlance evolved into new languages such as ancient French, Castilian and Portuguese, Latin became more and more removed from the ordinary people and evolved from a gateway to a hindrance to socially relevant knowledge. The controversy between Protestants and Catholics in the 16th century illustrates this change of role: whereas the former insisted that common believers should have direct access to the holy texts and therefore the Bible needed to be translated into the vernaculars, the Catholic Church reserved the interpretation of God's will to those with knowledge of theology and forbade, if not burnt, translations.

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The proliferation of academic languages in Europe

The dilemma between Latin and vernacular languages was not restricted to religion. Scientists also became entangled in the dilemma between the centuries-old language of culture, which facilitated immediate access to their colleagues but made it unintelligible to most of their own fellow countrymen, on the one hand, and their everyday languages on the other, since these facilitated the communication of knowledge to their own environment while also making it inaccessible to foreign colleagues. But the history of the languages of science in Europe is unique in some respects. At least since the Late Middle Ages, things followed a different path and *vulgar languages* started to be used for a variety of purposes that included more and more scientific issues (Alberni, Badia, and Fidora 2012). The reasons for this change are variegated. Politically, no single empire was powerful enough to unify (linguistically) the different nations of the continent. Socioeconomically, at least since the Late Middle Ages, scientific and technological knowledge progressively gained importance in the organization of public life and was therefore of relevance to administrators who had not mastered Latin. Besides, knowledge was progressively escaping the clutches of Church control. Add the fact that a growing number of people with specialised knowledge –from Ramon Llull to Leonardo da Vinci, to mention but two– did not feel comfortable with Latin. In short, little by little several vernacular languages started to be used as vehicles for academic issues, which led to the appearance of three language categories (Vila 2015):

- *Academic lingua franca*: the language of communication among scholars from different linguistic backgrounds.
- *Lingua academica*: any language used to produce, discuss, teach and disseminate scientific, technological and humanistic issues.
- *Non-academic language*: language not used for academic or scientific purposes at all.

The raising of many vernaculars to the status of *lingua academica* was slow and did not happen simultaneously in all languages or to the same extent. French, Italian and English-speaking scholars were more precocious and consistent in opting for their native languages for

scientific purposes, while most of their Central, Nordic and Eastern European colleagues stuck to Latin. Politics was a key factor all along this process: Centralized states were opposed to the languages of their minoritized nationalities gaining access to the academic world and, in general, all European Empires shared the supremacist conviction that non-European languages were unable to express academic thinking. The number of academic languages increased substantially in the 19th and 20th centuries, when many nationalities in Europe and other areas achieved self-government, promoted universal education, and espoused the principle that their languages were valid for all purposes.

The dispute at the top

The demise of Latin as a language of science left the door open for a handful of powerful *linguæ academicæ* to compete for the functions of academic *lingua franca* (Aracil 2004; Waquet 2001). The competition started as early as the 16th and 17th centuries –e.g., Galileo Galilei (1564-1642) combined Latin and Italian for his works– and increased in the 18th century: Carl Linnaeus (1707-1778) still published his work in Latin, but Antoine de Lavoisier (1743-1794) opted for his mother tongue as the main vehicle to communicate his work, as did Thomas Baye (c. 1701–1761). The rush to become the new academic *lingua franca* grew in intensity especially after the fall of the Ancien Regime, when scientific Latin finally collapsed, and more material was published in the several candidates to academic *lingua franca* (Gordin 2015). In short, over one or two centuries, French, German, English and, later, Russian, acted as partial *linguæ francæ* depending on such factors as scientific discipline and geopolitical balances.

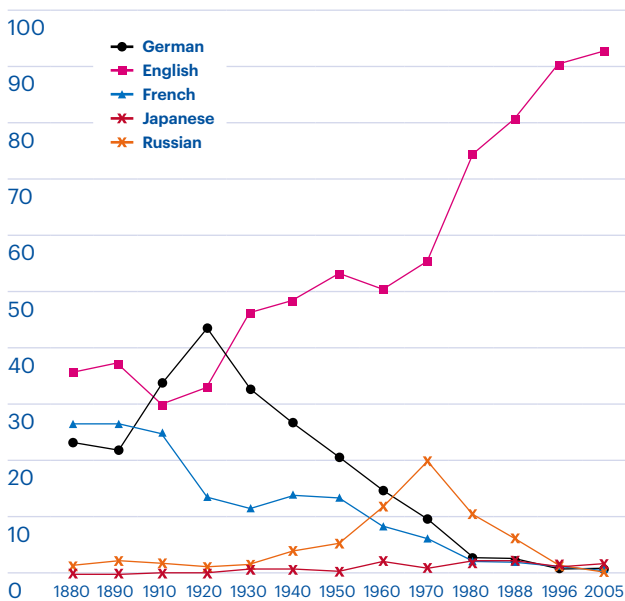
Nevertheless, this scenario was unstable. At the end of the day, enjoying the role of academic *lingua franca* implies a number of non-negligible benefits for the language community that achieves such a status, including the *privilege* of remaining monolingual if one so desires, the facility of being able to discuss scientific material in one's first language and the enlargement in the market and influence of research written in the *lingua franca*. It is therefore not surprising that the competition among the candidate languages was tainted by political interference, such as the exclusion of German from scientific meetings after the First World War, the efforts by the Soviet authorities to promote Russian to

the role of academic lingua franca, or the investment by the U.S. administration in securing the position of English (Gordin 2015).

Figure 1 illustrates the competition for the status of academic lingua franca since 1880, when three languages competed for this role during the first part of the period. In the 1930's, English became clearly predominant, a position reinforced in the aftermath of WW2. Russian seemed to gain impetus as a potential competitor in the 60's and 70's, but it lost its strength with the collapse of the communist bloc. Since the 1980's, English has reinforced its position at the expense of all the others.

At the end of the day, enjoying the role of academic lingua franca implies a number of non-negligible benefits for the language community that achieves such a status

Figure 1. Evolution in the language of scientific publications between 1880 and 2005. Percentages



Source: Ammon 2012

The current situation

By the end of the 20th century, the sociolinguistic situation in the scientific and academic fields could be described as follows. First, English had achieved the role of undisputed academic lingua franca. Second, a certain number of languages –between 79 and 100, depending on the criteria (Laponce 2006; Vila 2017)– had achieved the status of *lingua academica* and were used for creating, teaching and disseminating scientific

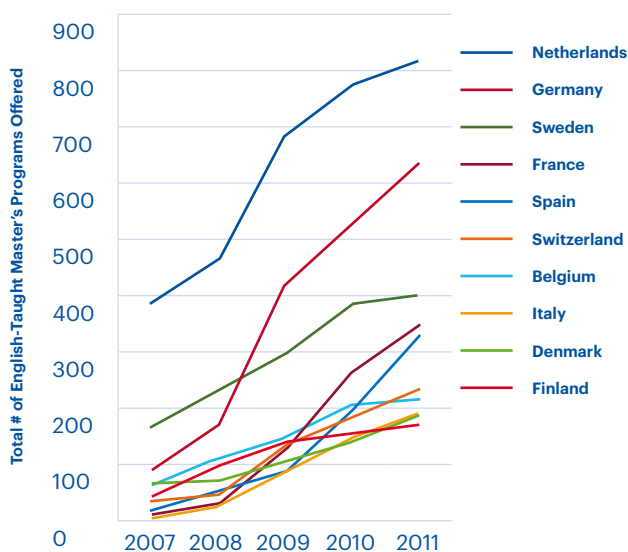
and technological knowledge within their language communities to different extents. Finally, most languages of the world had no academic use at all. This picture was not stagnant. In the last decades of the 20th century and the beginning of the 21st, some languages (e.g., Catalan, Basque) progressively joined the category of *lingua academica*, whereas others (e.g. Afrikaans) found their position in this group threatened (Arzo 2012; Pons i Parera 2015; Beukes 2015). But the most significant transformation in the sociolinguistic landscape of universities seemed to take place at the top of the scale. Once it had achieved the role of academic lingua franca, English continued to strengthen its position all over the world in the scientific and academic sphere, in both quantitative and qualitative terms, to the extent that some observers feared it might be in the process of being reconceptualized as THE *lingua academica par excellence* (Hultgren 2017; Lillis and Curry 2010).

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The growth of English as an academic language is especially fuelled by the combined effects of internationalization and commodification of higher education. On the one hand, in recent decades both governments and universities all around the globe have embarked upon numerous efforts to increase and improve the international dimension in all respects of academic life, including research and teaching. On the other, as the costs of higher education soared and public resources became insufficient, more and more universities from all around the world progressively felt tempted to participate in the growing market of transnational education, which by 2017 already involved 5,085,159 students worldwide (UNESCO). Besides, the reduction in the role played by the nation-states and the development of online courses basically seem to be favouring English (Helm 2019). As a consequence, in recent decades, the numbers of higher education courses, especially master's programmes, taught in English has been increasing substantially not only in English-speaking countries and in countries with an English colonial background, but also in nations where English was traditionally just a foreign

language and which had their own well-established academic languages (Dearden 2015; Hultgren, Gregersen, and Thøgersen 2014) (see Figure 2 and Table 1).

Figure 2. Evolution between 2007 and 2012 of Master's programmes in English registered in MastersPortal.eu



Source: (Brenn-White and van Rest 2012)

Table 1. Number of English-medium degrees (bachelors and master's) in the top 5 non-English courses in 2015

Country	EMI courses
The Netherlands	1034
Germany	835
Sweden	550
Denmark	482
Spain	404

Source: (Studyportal 2017)

Challenges and responses

The establishment of English as the main academic lingua franca has triggered a formidable movement directed at promoting adequate learning of this language all over the world (Dearden 2015). But the spread of English beyond lingua franca functions is raising numerous controversies, especially when it threatens the academic status of other languages. Some of the principal challenges this process seems to be posing are:

1. **Social and economic challenges:** Many authors have expressed their concern about the potentially socially divisive nature of English-medium instruction (EMI) in non-English-speaking countries. Depending on the countries, EMI has been accused of limiting access to university by students from lower socio-economic groups with lesser mastery of English, reinforcing (post) colonial relationships, discriminating against local students as opposed to foreign students, etc. (Dearden 2015; Hamel, Álvarez López, and Pereira Carvalho 2016; Hultgren 2017; Phillipson 2006). The socioeconomic risks associated with exclusive EMI may become acute in countries that never develop their own linguæ academic because one of the goals of EMI is precisely to facilitate mobility, but this mobility may have undesired results on macro levels:

"Ethiopia, Kenya, Malawi, Nigeria, South Africa, Uganda, Tanzania, Zambia and Zimbabwe have lost more than \$2bn from training doctors who then migrated to one of four developed countries: Australia, Canada, United Kingdom and the United States. Medical education is typically highly subsidised by the public sector in African nations, with more than half of the medical schools in sub-Saharan Africa either offering free tuition or charging less than \$1000 a year. At the same time, destination countries have saved billions of dollars in training costs by recruiting doctors who have been trained abroad." (Mills et al. 2011)

2. **Challenge for content learning and quality of teaching:** the use of a medium of discussion/instruction that is foreign both to researchers, students and teachers raises considerable suspicions:

"Speaking Italian to our countrymen is like watching a movie in colour, high definition and with very clear pictures. Speaking English to them, even with our best effort, is like watching a movie in black and white and very poor definition, with blurred pictures." Professor Emilio Matricciani, Appeal for Freedom of Teaching, quoted on the BBC news website, 16 May 2012 – www.bbc.co.uk/16 May 2012. (Quoted by Dearden 2015)

Indeed, graduates without adequate training in the local lingua academica may simply be unprepared to adequately accomplish their tasks:

"Whilst it may be advantageous to be able to read the many medical journals written in English thanks to a putative improved English language proficiency resulting from EMI, how will a doctor who has not experienced

clinically-oriented interaction in his/her home language during training perform when talking to patients who may not speak a word of English?" (Dearden 2015)

On the one hand, guaranteeing high quality teaching on EMI programmes in non-English-speaking nations faces a considerable number of technical and pedagogic difficulties that are often left unanswered by the responsible bodies.

3. **Epistemic challenge.** Both classical and modern social scientists have expressed that that the linguistic and cultural heterogeneity of Europe was a cornerstone for its prosperity, even for the development of such fundamental concepts as democracy and freedom (Stuart Mill 1859; Zakaria 2004). Language contributes significantly to the understanding of the world, and different languages introduce nuances to a grasp of the world that lead to different constructions of knowledge (Berthoud 2017; Gajo et al. 2013; Phillipson 2006). From this standpoint, the reduction in the number of (academic) languages may lead to the impoverishment of the avenues to grasp reality.
4. **Challenge for national identity and linguistic diversity:** The spread of EMI programmes will not put the strongest academic languages at any risk of losing their status of *lingua academica*. But English may be a real risk for many academic languages should they find themselves progressively eliminated from entire areas of academic activities, a process that has often been described as *domain loss* (Phillipson 2006; Haberland 2005). Of course, the maintenance of the world's linguistic heritage does not depend exclusively on the academic and scientific sphere. Nevertheless, in a world that is more and more defined as a *knowledge society*, the languages that do not convey modern knowledge will eventually run the risk of being associated only with their heritage, regarded as less valuable and eventually abandoned by their speakers.

The answers to these challenges are complex. The consolidation of an academic *lingua franca* is probably indispensable to the process of academic internationalization. Besides, it would not be realistic, be it only due to sheer demographic facts, to expect all languages on earth to become academic languages. But the European example suggests that the solid distribution of roles between a *lingua franca* and a considerable number of academic languages is not only possible, but also beneficial in social, political, economic and scientific terms. Neither science nor scientists exist in a social vacuum;

on the contrary, they are extremely dependant on adequate communication both with their colleagues and competitors and with the societies that support them. As long as the world remains multilingual, scholars and scientists will require an academic *lingua franca* to communicate with their distant colleagues, but also a *lingua academica* that facilitates their local work as well as communication with their fellow countrymen. It is up to the different language communities to decide how these two roles are to be fulfilled, but so far experience shows that plurilingual solutions tend to be better than monolingual ones. In this respect, administrators and policymakers would be wise to take note of the complexities of language policy issues in HE and learn a little bit more from existing experiences.

- **Public policies may have a determinant role in defining the languages used in the scientific and academic fields**, as shown by recent events in France, the Netherlands, South Africa, Algeria, and so many other places whether the use of a particular *lingua academica* has been an issue of public controversy. Especially relevant in this respect is the sentence whereby the Italian Highest Court appealed to the fundamental contribution of Italian as the country's *lingua academica* as its basis to reject the attempt by the Politecnico de Milano to switch to English as the main medium of instruction (Corte Costituzionale 2017).
- **Higher education is also a language learning environment and there are ways to improve the learning process.** Irrespective of whether it is called bilingual education, immersion, content and language integrated learning, etc., there is a vast array of technical and pedagogical possibilities to make HE an enriching process that leads to plurilingualism (Knoerr, Weinberg, and Buchanan 2018).
- **The status of *lingua academica* is less dependent on demography as might be thought.** It is obvious that languages cannot exist without a minimal number of speakers. But the threshold for a language to become a thriving academic language is much smaller than is usually thought. Languages like Norwegian, Lithuanian and Slovene, with less than 5 million speakers, are healthy academic languages. Icelandic, with less than 400,000 speakers, is a good example that it is not only multimillionaire languages that can be academic languages. Nordic languages are examples of how medium-sized academic languages are coping with the spread of English (Hultgren, Gregersen, and Thøgersen 2014).

- **No language is intrinsically unfit to become a lingua academica, and there is no need for a nation state to promote a language to that status.** Several very different languages have assumed academic roles in recent decades without being the main language of sovereign states. Catalan has become the predominant language of HE in Catalonia in a trilingual environment (Pons i Parera 2015; Vila 2018). Other languages like Basque, Welsh and Kurdish have progressed to that status as well.

References

- Alberni, A., Badia, L. & Fidora, A. (eds) 2012. Knowledge and Vernacular Languages in the Age of Llull and Eiximenis. *Icrea Studies on Vernacularization / El Saber i Les Llengües Vernacles a l'època de Llull i Eiximenis. Estudis ICREA Sobre Vernacularització*. Barcelona: Publicacions de l'Abadia de Montserrat.
- Ammon, U. (2012). Linguistic Inequality and Its Effects on Participation in Cientific Discourse and on Global Knowledge Accumulation - with a Closer Look at the Problem of Second-Rank Language Communities, *Applied Linguistics Review* 3 (2): 333–55.
- Aracil, L. V. (2004). *Do Latim Às Línguas Nacionais: Introdução à História Social Das Línguas Europeias*. Santiago de Compostela: Associação de Amizade Galiza-Portugal.
- Arzoz, X. (2012). The Transformation of Higher Education and Medium-Sized Language Communities. In *Language Law and Legal Challenges in Medium Sized Language Communities: A Comparative Perspective*, edited by Antoni Milian-Massana, 2019–2252. Barcelona, Institut d'Estudis Autònoms.
- Berthoud, A-C. (2017). Le Défi Du Multilinguisme Pour l'enseignement Supérieur et La Recherche In *El Multilingüisme En Blanc i Negre. Actes de La II Jornada de La Càtedra Pompeu Fabra. Barcelona 10 i 11 de Novembre Del 2016*, edited by Càtedra Pompeu Fabra, 19–27. Barcelona: Universitat Pompeu Fabra.
- Beukes, A-M. (2015). Challenges for South Africa's Medium-Sized Indigenous Languages in higher education and research environments, In Vila, F. X & Bretxa, V. (eds.) *Language Policy in Higher Education: The Case of Medium-sized Languages*, Bristol, UK: Multilingual Matters, pp.132-152.
- Brenn-White, M. & Van Rest, E. (2012). English-Taught Master's Programs in Europe New Findings on Supply and Demand, Institute of International Education. http://www.iie.org/Research-and-Publications/Publications-and-Reports/IE-Bookstore/English-Language-Masters-Briefing-Paper#.WCNj4ck_70Q.
- Corte Costituzionale. (2017). Sentenza 42/2017: corsi universitari in lingua inglese e in lingua italiana. Corte Costituzionale.
- Dearden, J. (2015). English as a medium of instruction – a growing global phenomenon, Oxford: Oxford University Press. https://www.britishcouncil.org/sites/default/files/e484_emi_-_cover_option_3_final_web.pdf.
- Gajo, L., Grobet, A. et al. (2013). Plurilingualism and Knowledge Construction in Higher Education In Berthoud, A., Grin, F., & Lüdi, G., (eds.) *Exploring the Dynamics of Multilingualism: The DYLAN Project*, Amsterdam ; Philadelphia: John Benjamins Publishing Company, pp.279-298.
- Gordin, M. D. (2015). *Scientific Babel: How Science Was Done Before and After Global English*, Chicago: University of Chicago Press.
- Haberland, H. (2005). Domains and Domain Loss. In Preisler, B., Fabricius, A., Haberland, H. et al. (eds.) *The Consequences of Mobility*, Roskilde: Roskilde University, Department of Language and Culture. <http://ruc.ruc.dk/bitstream/1800/8701/1/Haberland.pdf>.
- Hamel, R. , Álvarez, E. & Pereira, T. (2016). Language Policy and Planning: Challenges for Latin American Universities, *Current Issues in Language Planning*, 17 (3–4): 1–19.
- Helm, F. (2019). EMI, Internationalisation, and the Digital, *International Journal of Bilingual Education and Bilingualism* 0 (0): 1–12. <https://doi.org/10.1080/13670050.2019.1643823>.
- Hultgren, A-K. (2017). The Drive towards English as a Medium of Instruction. In E. Macaro (ed.) *Non-English-Dominant European Higher Education: The Role of University Rankings. English Medium Instruction: Global Views and Countries in Focus: Introduction to the Symposium Held at the Department of Education, University of Oxford on Wednesday 4 November 2015. Language Teaching*, 1–18. <https://doi.org/10.1017/S0261444816000380>.

- Hultgren, A.-K., Gregersen, F. & Thøgersen, J. (eds). (2014). *English in Nordic Universities: Ideologies and Practices*. Amsterdam, John Benjamins. https://www.academia.edu/7956516/English_in_Nordic_Universities_Ideologies_and_practices.
- Knoerr, H., Weinberg, A. & Buchanan, C.E. (eds). (2018). *Enjeux Actuels de l'immersion Universitaire = Current Issues in University Immersion*. Ottawa: GRINU. <http://ilob-olbi.juliencouturecentre.ca/cgi-bin/koha/opac-detail.pl?biblionumber=2052>.
- Laponce, J. (2006). *Loi de Babel et autres régularités des rapports entre langue et politique*, Québec: Presse de l'Université Laval. <http://www.pulaval.com/produit/loi-de-babel-et-autres-regularites-des-rapports-entre-langue-et-politique>.
- Lillis, T. & Curry, M. J. (2010). *Academic Writing in a Global Context: The Politics and Practices of Publishing in English*. Abingdon, Routledge. <http://www.routledge.com/books/Professional-Academic-writing-in-Global-Context-isbn9780415468831>.
- Mills, E. J., Kanters, S., et al. (2011). The Financial Cost of Doctors Emigrating from Sub-Saharan Africa: Human Capital Analysis, *BMJ* 343 (November): d7031. <https://doi.org/10.1136/bmj.d7031>.
- Ostler, N. (2010). *The Last Lingua Franca: English Until the Return of Babel*. New York, Allen Lane.
- Phillipson, R. (2006). English, a Cuckoo in the *European Higher Education Nest of Languages?*, *European Journal of English Studies* 10 (1): 13–32.
- Pons i Parera, E. (2015). The position of Catalan in higher education. In *Language Policy in Higher Education: The Case of Medium-sized* Vila, F.X. & Bretxa, V. (eds.) Languages, Bristol, UK, Multilingual Matters, pp.153-180.
- Stuart Mill, J. (1859). *On Liberty*. London: John W. Parker & son.
- Studyportal. (2017). Non-English European Countries with Most English-Taught Degrees - MastersPortal. Com. 26 April 2017. <https://www.mastersportal.com/articles/1717/non-english-european-countries-with-most-english-taught-degrees.html>.
- UNESCO. n.d. 'UIS Statistics'. Accessed 4 September 2019. Retrieved from: <http://data.uis.unesco.org/?lang=en&SubSessionId=f94efa22-04ab-4aa0-a8de-dab8bfc907a7&themetree-id=-200>.
- Vila, F. X. (2015). Language Policy in Higher Education in Medium-Sized Language Communities: An Introduction. In Bretxa, V. & Vila, F.X. (eds.) *Language Policy in Higher Education: The Case of Medium-sized Languages*, Bristol, UK: Multilingual Matters, pp.1-14.
- (2017) Les Llengües Mitjanes Com a Llengües Acadèmiques: Situació i Perspectives'. In Bastardas-Boada, A., Boix-Fuster, E., & Torrens, R.M. *El Català, Llengua Mitjana Europea. Multilingüisme, Globalització i Sostenibilitat Lingüística*, Barcelona: Octaedro, pp.235-265.
- (2018) Linguistic Models in Higher Education in Catalonia: Origenes, Rationale, Achievements and Challenges = Modèles Linguistiques En Enseignement Supérieur En Catalogne : Origenes, Justifications, Réussites et Défis. In Knoerr, H., Weinberg, A., & Buchanan, C.E., (eds.) *Current Issues in University Immersion = Enjeux Actuels de l'immersion Universitaire*, Ottawa: Groupe de recherche en immersion au niveau universitaire (GRINU), pp.55-88. Retrieved from: <http://ilob-olbi.juliencouturecentre.ca/cgi-bin/koha/opac-detail.pl?biblionumber=2052>.
- Waquet, F. (2001). *Latin, or The Empire of the Sign: From the Sixteenth to the Twentieth Century*. NY, Verso.
- Zakaria, F. (2004). *The Future of Freedom: Illiberal Democracy at Home and Abroad*. New York / London, W.W. Norton & Company.

5. Current changes in the field of science and technology are promoting an idea of human and non-human intelligence that goes beyond the notion of knowledge. What critical and proactive role must humanities play in this set of processes of change and what added value can they contribute?

The Contemporary Posthumanities

Rosi Braidotti

Abstract

This article addresses the growth of new areas of research in the contemporary Humanities, i.e. the Environmental and Digital Humanities, the Medical, Neural, Geo- and Bio-Humanities, the Public, Civic and Global Humanities and so on. These transversal areas of study, which I define as the Posthumanities, are built on a series of inter-related questions that connect the academic world to major societal challenges. I situate this phenomenal growth as a meeting point between the Fourth industrial Age and the Sixth Extinction, that is to say between an advanced knowledge economy, which still perpetuates patterns of discrimination and exclusion, and the threat of devastation of both human and non-human entities due to climate change. This convergence calls for critical analyses and qualitative assessment. Building on the critiques of Western humanism on the one hand and of anthropocentrism on the other, I will discuss the impact of the rise of the Posthumanities in three major areas: the constitution of our subjectivity; the general production of knowledge and the institutional practice of the academic Humanities. Some of the leading questions relate to the implications of the fact that knowledge production is no longer the prerogative of academic or formal scientific institutions such as universities, and what we are to make of the sudden growth of these new trans-disciplinary hubs that re-appropriate and redefine the contemporary Humanities.

One of the defining features of the contemporary university is the rise of programs, curricula, centres and institutes in new fields of enquiry that are known as: the Environmental Humanities; Digital Humanities, Medical Humanities, Neural or Cognitive Humanities; Geo or Earth Humanities; Public or Global Humanities and other 'new' humanities. I positively define these discursive and institutional fields as the Posthumanities. My aim in this chapter is to present an overview of this contemporary phenomenon and to attempt to make an assessment of it.

The Posthuman Convergence

The emergent phenomenon of the Posthumanities is taking place within the posthuman predicament (Braidotti 2013, 2017, 2019; Braidotti and Hlavajova 2018), defined as the convergence of post-humanism on the one hand and post-anthropocentrism on the other. Post-humanism has a long and established tradition of criticism of the presumptuous and exclusionary Humanist claim that 'Man' is the alleged measure of all things. Post-anthropocentrism, on the other hand, criticizes species hierarchy and anthropocentric exceptionalism. Although these inter-disciplinary critical axes overlap and tend to be used interchangeably in general debates, they do not necessarily follow from each other. One can be critical of Western humanism and remain perfectly anthropocentric, or critique anthropocentrism but cling to humanistic values. Thus these two critical lines differ, both in terms of their genealogies and in the social manifestations they engender. By stressing their convergence, I mean to respect their respective specificity, but also avoid segregating their knowledge claims.

The convergence of these lines of enquiry is responsible for an unprecedented growth of new, trans-disciplinary areas of scholarship, centered on the question of what constitutes the basic unit of reference to define what counts as human. They are not converging in harmonious synthesis, but are producing a qualitative leap of theoretical, social and political effects.

It is important to note from the start that the Humanities as an academic field are much better equipped to deal with Humanism, including its anti/post-humanist critiques, than they are suited to tackle anthropocentrism. Humanities scholars are not trained to ask questions such as: 'what do you mean by human?', 'are we human enough?', or 'what is human about the academic Humanities?' Tradition rather encourages us to delegate to anthropologists and biologists such scientific discussions about *Anthropos*, while we – in the Humanities – focus on Man, as culture, polity or civilization. Accordingly, the distinction between organized human

life – bios- and non-human life- zoe- is of importance, as it upholds a categorical and hierarchical divide between culture and nature.

Within such binary schemes, the Humanities tend to define Man mostly by what he is not, i.e. through dualistic oppositions, which aim to confirm that he is not woman/LGBTQ+/animal/indigenous/vegetable/mineral. These oppositional patterns oppose Man to a range of sexualized, racialized and naturalized ‘others’ that define him by negation. Moreover, these dialectical oppositions institute an exclusionary vision of Man as the thinking being *par excellence*, i.e. the master of a dominant culture. In this respect, Humanism and anthropocentrism work in tandem to uphold the view of the human at work in the academic Humanities.

Working within the posthuman convergence challenges these traditional mental habits. It does so on the basis of two inter-linked assumptions: the first is that ‘human’ is not a neutral term at all, but rather a power-driven one that indexes access to a dominant cultural system, attributing rights of citizenship and entitlements to a sense of belonging. The second is that posthumanity is not some dystopian or utopian condition, let alone an apocalyptic one, but rather a mark of our historicity, a statement about our living conditions. Moreover, I argue that it is an affirmative statement, not the expression of a terminal crisis. The point is that the posthuman convergence encourages us to move beyond the set representational habits of dominant Humanism and customary anthropocentrism. It is simply inappropriate nowadays to start from the centrality of the human and uphold the old dualities that separate him from his multiple ‘others’.

The posthuman convergence encourages us to move beyond the set representational habits of dominant Humanism and customary anthropocentrism

Moreover, the convergence-factor is also important in posthuman scholarship in order to avoid the disturbing phenomenon of discursive segregation. For instance, research on AI; on the Anthropocene; on the new political economy of post-work societies; on climate change and extinction, etc. – are producing their respective views on the human/non-human, independently of and often in contrast to one another. This diminishes the collaborative force of these new research areas, which would gain by working transversally together. Moreover, most of them fail to incorporate the critical insights of

radical epistemologies such as feminism, post-colonialism and race theories. These omissions concern both the themes of research and their methods, and these new separations do not help to construct the kind of trans-disciplinary task-force I believe we need in order to adequately address the complexity of issues confronting critical scholarship in the posthuman convergence.

At heart, the posthuman predicament confronts us with a fundamental tension: “we” may well be together in confronting the threats and challenges of our times, however “we” are not One, or the Same. We are instead positioned differently in terms of power, entitlement and access to the very condition- environmental social and technological, that defines us. Therefore, “WE” are not a homogeneous, unitary notion, but a complex and diverse one, which reflects the multiple differences that compose “us”. To describe these locations as contradictory does not even begin to approximate the tensions and paradoxes they generate.

Awareness of the specificity of our respective locations need not lead us to relativism, but rather to the embedded and embodied analysis of our materially located positions. This can be achieved through a number of possible methods. For instance, the multi-directional or nomadic feminist politics of locations (Braidotti, 2011) conjoined with the neo-materialist politics of immanence (Deleuze, 1996). Both of these can be set in dialogue with much older indigenous epistemologies (Whyte, 2016), which are revived today by decolonial critiques in terms of their perspectivism (Viveiros de Castro, 1998, 2009; Descola, 2009, 2013; Braidotti and Bignall, 2018). These critical perspectives emphasize transversal connections and a multiplicity of scales, layers and locations for contemporary posthuman subjects and how they produce knowledge.

The Posthumanities express the repositioning of knowledge production practices within this posthuman convergence, introducing significant changes to both the subjects and the objects of knowledge. Both critical in their evidence-based and curiosity-driven analyses of the contradictions of the posthuman predicament, and creative or speculative in their attempts to come to terms with them, the Posthumanities aim to expand our understanding of the human, not to relinquish it. They rest upon materially embedded and embodied locations and coordinates that reflect the diverse ways of being human and the diversity of possible ways of knowing. This transversal process of knowledge pro-

duction relocates the human, in relation to multiple non-humans - both organic and technological- within the contemporary social and scientific horizons of advanced capitalism. The field of the Posthumanities shows that the proper object of study for the Humanities today is neither humanistic Man nor Anthropos, but rather a wide range of heterogeneous objects constructed in knowledge-producing alliances. In fact, the human is just one of the formations currently being reconfigured in the posthuman convergence.

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Cognitive Capitalism, Bio-Power and Necro-Politics

The posthuman convergence is situated within the accelerations and/or de/re-territorializations of advanced capitalism (Deleuze and Guattari, 1987), defined as a schizoid, or structurally fractured system. It is a knowledge economy driven by the inhuman intelligence of advanced technologies, but it is also an inhumane system, which is willing to sacrifice multiple human and nonhuman entities for the sake of profit. Also known as cognitive capitalism (Moulier-Boutang, 2012), platform capitalism (Srnicek 2016), or surveillance capitalism (Zuboff, 2019), this Fourth Industrial Revolution (Schwab, 2015), which also happens to coincide with the acceleration of climate change in the Sixth Extinction (Kolbert, 2014), frames the posthuman convergence.

The acceleration in the consumption of commodities, the monetarization of social interaction and services, coupled with the multiplication of 'quantified selves', makes for an unsustainable system. Advanced capitalism is a 'future eater' (Flannery, 1994) that erodes its own foundations and sabotages the conditions that make its own future possible. The devastating speed at which data, capital, bits and bytes of information circulate is also built into the commodities we consume, as evidenced by the planned obsolescence of our electronic devices. But unsustainable speed and pressure, with alarming rates of burn-out and fatigue, are also

written into our working lives and the patterns of our social interaction.

The novelty is not only the speed, but also the kind of capital that constitutes value today, namely the informational power of matter itself – its immanent qualities and self-organizing capacity. The bio-genetic structure of contemporary capitalism enhances the ability to generate profits from scientific and economic comprehension of all that lives.

This produces a new political economy: 'the politics of Life itself' (Rose, 2007), also known as 'Life as surplus' (Cooper, 2008), or, quite simply as the post-genomic economy of 'biocapital' (Rajan, 2006). The true capital today is the vital, self-organising power of converging technologies, whose vitality seems unsurpassable: nanotechnologies, artificial intelligence and neural sciences; information technologies; genetics, synthetic biology and stem cell research. The systemic exploitation of living matter through advanced technological mediation and the systems for patenting genetic codes of multiple species is at the core of a political economy of "bio-piracy" (Shiva, 1997). And this is not reserved to humans only but also involves all non-human species and agents as well.

Our universities are in the midst of these exciting and problematic developments—we academics are the drivers of cognitive capitalism. Just consider that artificial meat was first made in 2013 at Maastricht University in the Netherlands, from real meat stem cells grown in a lab and mixed with calf serum. The first prototype cost \$325,000 but that price has since dropped to just over \$11 for one synthetic burger (\$80 per kilogram of meat).

To a certain extent, these technologies and sciences of Life are bringing an end to the exploitation of natural resources, in that they are capable of generating alternative life-forms. At the other end of the spectrum, they even allow for de-extinction (Minteer, 2018) and re-wilding practices (Fraser, 2009; Monbiot, 2013), in a way that formalizes the de-naturalization of matter and its emergence as informational data.

The paradoxical result of the newly acquired capacity to mine, store and recompose the basic codes of life itself is that it induces, if not the actual erasure, at least the blurring of the categorical distinction between humans and other species when it comes to profiting from them. Seeds, cells, plants, animals and bacteria, but also codes, algorithms and networks, fit into this logic of commodification, producing an opportunistic form

of post-anthropocentrism that spuriously unifies all the species under the imperative of the market economy and profit. The excesses of the Capitalocene (Moore, 2013) are threatening the uniqueness of *Anthropos*, as well as the sustainability of the planet as a whole.

What become downgraded in the process of capitalizing on Life itself are the power of survival and the social value of many classes of humans, who are considered disposable. These include the working class of the former industrial culture, the masses of the “precariat” and the underpaid, often unregistered migrant workers who provide the manual labour in agriculture, building, transportation, assembling work, etc. The many who work in the underbelly of the Fourth industrial revolution constitute the digital proletariat of today. Therefore, the contemporary world has more than its fair share of injustice, violence and cruelty to account for. The speed and brutality of the flows of capital and the on-going technological changes consolidate older and install new power relations, best represented by the monopoly of the four GAFA (Google, Apple, Facebook and Amazon) tech giants over the new economy.

But they also introduce new necro-political modes of governance that concern not only the management of the living, but also multiple practices of managed decline and orchestrated dying.

Consider for example the material destruction of human bodies, social infrastructure and the environment through the industrial-scale warfare led by drones and other unmanned vehicles. The global effects of migration as a result of dispossession, wars, expulsions, climate change and terror also need to be factored in. Refugee camps and other detention zones are multiplying, as are our militarized borders, multiple walls and the weaponization of the social space. Whole sections of humanity are down-graded to the status of extra-territorial infra-humans, such as refugees and asylum seekers, whom we treat as alien others that are not meant to be here at all. The same fate is reserved to multiple non-human species, which are confronting staggering rates of extinction.

Let it be clear therefore that, far from marking the extinction or the impoverishment of the human, the posthuman condition is a way of reconstituting it- for some as a return to neo-humanist universalism, coupled with forms of enhancement, for others in a new alliance with non-human entities of both the organic and the technological kind. Many dynamics of subject formation are coming into being in this posthuman conjunction.

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The Posthumanities

The Posthumanities are a productive response to these contradictory and challenging developments. For instance, the highly popular Digital and Environmental Humanities provide both a fashionable and necessary reframing of contemporary knowledge. They take on respectively the ubiquity and pervasiveness of technological mediation and the escalation of environmental damage and species extinction. They receive widespread institutional support and funding and introduce both quantitative and qualitative shifts to the practice of the academic Humanities.

The advantages of these new (Post)Humanities has to be assessed in relation to the critiques of Eurocentric Humanism and its masculinist and anthropocentric assumptions, which I raised at the start of the chapter. The limitations of the traditional epistemic structure have been exposed over the last thirty years by social movements and academic discourses that called themselves “critical studies” (Braidotti, 2013, 2016a). Women’s, gay and lesbian, gender, feminist and queer studies; race, postcolonial and subaltern studies, alongside cultural studies, film, television and media studies and science and technology studies are the prototypes of what I consider a first generation of critical studies. They constitute the radical epistemologies that have voiced the insights and knowledge of the sexualized and racialized structural ‘others’ of the humanistic ‘Man of reason’ (Lloyd, 1984; Braidotti, 2002).

In many ways, critical studies paved the way for the Posthumanities, in that they stressed the social responsibility of academic knowledge production and brought academic research closer to society. They demonstrated the compatibility of rationality and violence, of progress with practices of structural devastation and exclusion, thereby challenging the pretence to any self-regulating powers of scientific reason. This critical assessment was not intended as an anti-science stance, but rather as a productive way of assessing

the underlying power relations at work in the making of science, philosophy and knowledge. They grounded their knowledge practices into the lived experience and the standpoint of the socially excluded, arguing for instance that humanist 'Man' is an exclusionary category that organized differences on a hierarchical scale of decreasing worth. As a result, the sexualized, racialized and naturalized 'others' became not only different from the humanistic norm, but also worth less than the Man that embodies it.

Critical studies paved the way for the Posthumanities, in that they stressed the social responsibility of academic knowledge production and brought academic research closer to society

Critical "studies" also argued that these power relations shaped the institutional practice of the academic Humanities through two institutional and conceptual devices: structural anthropocentrism on the one hand and Eurocentrism, or "methodological nationalism" (Beck, 2007) on the other. Institutionally, critical studies conducted negotiations with the rules, conventions and protocols of the academic disciplines. Some settled in their interstices, others took the nomadic path (Braidotti, 1991, 2011a; Stimpson, 2016) and moved outward, in what I call the becoming-world of knowledge production practices (Braidotti, 2016b). They rejected the hierarchies of sexualized, racialized and naturalized otherness, in order to improve their inclusiveness, diversity and objectivity (Braidotti 2018, 2019). What was also at stake in the trajectory of critical studies was a revision of what it means to be human. But, as I will go on to argue next, even these trans-disciplinary and critical forms of knowledge production are not free from an anthropocentric bias.

The posthuman convergence both intensifies and shifts the grounds of these critical discourses, by focussing on their often implicit anthropocentrism. This was made manifest by a second generation of critical studies that engaged with non-human objects and subjects of knowledge. Significant examples are: animal studies; eco-criticism; plant studies; environmental studies; ocean studies; Earth studies; food and diet studies; fashion, success and critical management studies. New media proliferated into sub-sections and meta-fields: software, internet, game, algorithmic and critical code studies. Because of a major concern with security, security studies have emerged as a priority, alongside death,

suicide and extinction studies. Challenging the anthropocentric core of the Humanities is not just a corrective measure that adds a quantity of new objects of study, but is also an attempt to enact a qualitative shift.

The Posthumanities are a new development that is propelled, among others, by these rich and controversial discourses in combination with corporate concerns and investments. They are both a reaction to the convulsive speed of cognitive capitalism and an attempt to redefine its terms. Although they operate comfortably within the neoliberal economic order, they also constitute an affirmative attempt to repurpose these accelerations towards non-profit and critical aims.

Challenging the anthropocentric core of the Humanities is not just a corrective measure that adds a quantity of new objects of study, but is also an attempt to enact a qualitative shift

The main qualitative shift induced by the Posthumanities is to reposition non-human agents of knowledge: terrestrial, planetary, cosmic entities, the naturalized others like animals and plants, but also the technological apparatus, as agents and co-constructors of thinking and knowing. A general ecology (Hörl, 2018) is needed to account for the importance of computational, as well as environmental factors. Considering moreover the persistence of social inequalities, the Humanities need to take a critical turn towards zoe/geo/techno-bound perspectives (Braidotti 2017, 2018). This re-orientation entails a number of inter-locked renegotiations, between academic and profit-oriented knowledge, between universities and the flows of capital and between the Humanities- which I define as the subtle sciences of human complexity - and the Life sciences, striving to achieve a culture of mutual respect.

The key concepts to assess the qualitative contribution of the Posthumanities are: heterogeneity, complexity and transversality (Braidotti, 2019). They emphasize the material and discursive inter-connections between intellectual labour - academic work and critical scholarly research - and the socio-economic material formations of the market. The new modes of knowledge production they introduce cut across traditional institutional divides, both inside and outside the university structure. They combine profit-minded with curiosity-driven, non-profit knowledge and take a range of different stances in relation to both post-humanism and post-anthropocentrism.

Post-constructivist Methods

The minimal aggregating factor in the making of the Posthumanities is an intended or at times merely casual shift beyond humanistic and anthropocentric bias, which makes them liable to challenge the nature-culture, human/non-human, bios/zoe distinctions. It is worth stressing that these categorical divides are not only conceptual, but also methodological, in that they support a social constructivist methodology based on dualistic oppositions. This method is crucial not only for the traditional Humanities, but also for critical studies: just think of the dictum that one is not born as but becomes a woman, or any other gendered category. The point in these binary ways of setting the nature-culture relation is to de-naturalize inequalities and offer emancipatory ways of intervening on the social structures. A binary opposition offers the promise of reversing the power relations and hence of improving them.

Post-constructivist thinking challenges the oppositional scheme and the falsified distinctions it creates between the nature-culture, human/non-human, bios/zoe distinctions, etc. But finding a suitable alternative methodology as a way of dealing with the challenges of our eco-sophical, post-anthropocentric, geo-bound and techno-mediated times may be the real challenge for the Posthumanities. My methodological counter-proposal is a neo-materialist politics of locations and an expressivist form of empiricism that is connected to a vital, embedded and embodied, affective and relational understanding of living entities, including humans (Braidotti 2013; 2019). Let me explain.

Post-constructivist thinking challenges the oppositional scheme and the falsified distinctions it creates between the nature-culture, human/non-human, bios/zoe distinctions

Vital neo-materialism refers to the concept that matter, the world and humans themselves are not dualistic entities structured according to principles of internal or external opposition, but rather are materially embedded subjects-in-process circulating within webs of relations. This translates into a nature-culture continuum, which is best expressed by Genevieve Lloyd's assertion that we are all "part of nature" (1994), insofar as nature has become naturecultural and that it is technologically mediated. Following contemporary Spinozism (Deleuze, 1988; Citton and Lordon, 2008), matter is one and driven

by the ontological desire for self-expression. All entities are variations on a common theme and they express the fundamental desire to endure in their existence and go on becoming, within a differential process ontology. In other words, we differ from each other all the more as we co-define ourselves within the same living matter—environmentally, socially, and affectively.

Ontological relationality is of the essence. Each individuated entity is the expression of a common core, which is the freedom to affect and be affected by others. The driver of individuation is an entity's relational capacity and the ability to grow with and become alongside others. It also constitutes a democratic shift towards a radically immanent kind of ontological pacifism, driven by affirmative ethics. This implies the rejection of negativity, antagonism and of violent dialectical oppositions. This understanding of living matter as a symbiotic and collaborative system of co-dependence supports an ethology of forces which, considering all entities as variations within a common matter, produces a displacement of anthropocentric visions and value systems. We have to deal with the continuum of self-organizing vital systems, of the environmental technological, psychic, social and other kinds.

By extension we cannot assume a theory of subjectivity that takes for granted naturalistic foundationalism. Nor can we rely on a purely social constructivist and hence dualistic methodology, which disavows the ecological dimension of the process of subject formation. Subjects defined as transversal relational entities do not coincide with a liberal individual, but are rather a 'haecceity'—which means an event of complex singularities or intensities, a degree of power as *potentia* (Deleuze and Guattari, 1994). Subjectivity is thus both post-personal and pre-individual and fully immersed in the conditions that one is trying to understand and modify, if not overturn.

The critical Humanities therefore need to fulfil the multiple – and potentially contradictory – requirements of a posthuman process ontology. It is crucial, for instance, to appreciate the interconnections between the greenhouse effect, the depletion of bio-diversity, the worsening global status of women and LGBTQIA's, racism, xenophobia and frantic consumerism. We must not stop at any fragmented portions of these realities, but rather trace transversal interconnections among them. A vital neo-materialist approach, supporting a process ontology, is the best way to ground and sustain these relational links.

Thus, the neo-materialist expressivist method rests on two main notions. The first is the emphasis on the embodied and embedded materialist nature of the subject. This in turn produces a non-antagonistic, that is to say trustful relationship to 'Life', living systems and to lived experience. The second shift is towards a focus on the dynamic interaction of differential processes, outside the scheme of dialectical opposition, in a multi-layered and multi-directional relational manner. In other words, a post-constructivist method stresses the need for a change of scale, to unveil power relations where they are most effective and invisible: in the specific locations of one's own intellectual, discursive and social location and perspectives.

Another important implication of a neo-materialist, post-constructivist approach is that it foregrounds issues of power and entitlement, as opposed to the by-now predictable corporate sound-bites about the social responsibility of institutions, including universities. I believe it is more useful to raise questions that have less to do with morality than with ethics. The former deals with rules and regulations, while the latter interrogates power in the dual sense of entrapment (*potestas*) and empowerment (*potentia*). The moralization of public debates about the effects of cognitive capitalism, or the value of the Humanities – to give some relevant examples – is a defining feature of neo-liberal governance. The over-emphasis on moral values is all the more misleading as capitalism is primarily responsible for the immoral and unjust monetarisation of all that lives (Brown), the privatisation of knowledge production and the displacement of the centrality of the human in the politics of Life itself.

The moralization of public debates about the effects of cognitive capitalism, or the value of the Humanities - to give some relevant examples – is a defining feature of neo-liberal governance

The so-called "advanced" aspects of contemporary bio-technological developments paradoxically contain archaic components, in terms of the de-humanizing impact they exercise on many humans, as well as in the systematic depletion of non-human life-forms. But they also preach a systemic form of de-materialization of embedded and embodied entities, through technological mediation and data collection, which is one of the reasons why my counter-proposal is a new materialist politics of locations and perspectivist alternatives, supported by a post-constructivist methodology.

Critical Assessment of the Posthumanities

One of the features of the posthuman convergence is that there is as much, if not more, knowledge and scientific research produced today outside the university and academic institutions, as inside. The primacy of research in our information economy is also one of the reasons why many political forces today want to under-fund and dismantle universities. These attacks on academic research often target the Humanities in particular and tend to either oppose them completely, or reduce them to a museum function, indexed on national interests.

One of the features of the posthuman convergence is that there is as much, if not more, knowledge and scientific research produced today outside the university and academic institutions, as inside. The primacy of research in our information economy is also one of the reasons why many political forces today want to under-fund and dismantle universities

In this respect, a new paradigm has emerged in public discussions of the posthuman predicament, and which is worth stressing. The dominant consensus combines an analytically post-humanist analysis with a normatively neo-humanist moral stance. This compromise is an attempt to moderate the contradictions of our socio-economic structures and to preserve the dominant normative system in the practice of contemporary techno-science. For example, individuals are encouraged to develop a sense of moral responsibility for their health – via the management of lifestyle, weight and the monitoring of quantified selves - without necessarily raising the political issue of the dismantling of the welfare state and the monetarization of well-being, let alone social justice. The same goes for the management of one's genes, mental health and reproductive functions.

I singled out (Braidotti, 2013) examples of this dominant paradigm from brain research (Rose 2013), primatology (de Waal 2009) and media studies (Castells 2010, Verbeek 2011). I recommend some critical distance from this popular but internally contradictory position that combines analytic posthumanism with normative neo-humanism. Whereas this perspective neglects the analysis of power relations, I am committed to accounting for them, with the help of the radical discourses devel-

oped by different generations of “studies”, especially feminism and anti-racism. I believe it is useful to suspend questions of normative judgement and focus instead on issues of power (Foucault, 1995; Deleuze, 1988). This allows us to raise the issue of social justice, access to new technologies and to foreground the necro-political aspects of contemporary power (Mbembe, 2003). Other issues relevant to the contemporary Humanities are the rise of security concerns and surveillance issues and the weaponization of the social sphere in a continuing “war on terror”. These factors have a negative impact on the critical function of universities, on alternative theory-production and on academic freedom.

Instead of re-instating the traditional normative system, I propose experimentation with a different kind of relational ethics, so as to address the complexity of our times. I firmly believe that we – critical scholars in the humanities today – need to embrace the opportunities offered by the posthuman convergence and steer the transversal Posthumanities towards new forms of solidarity, social justice and democratic debate and dissent. Posthuman affirmative ethics is central to the project of the critical Posthumanities. The praxis of constructing affirmative values, relations and projects is central to sustaining these posthuman, but all too human, aspirations (Braidotti, 2006, 2017).

The critical Posthumanities are currently emerging as transversal discursive fronts, not only around the edges of the classical disciplines but also as off-shoots of the successive generations of the inter-disciplinary critical discourses of the “studies” I mentioned above.

The vitality is telling, as shown by an array of publications, institutional courses and research projects, as well as a telling outburst of neologisms. See, for instance the ecological humanities, the Environmental Humanities, sub-divided into the Blue Humanities, which study seas and oceans, and the Green Humanities that focus on the Earth. These are also known as the Sustainable Humanities and, in more crass variations, Energy humanities and Resilient Humanities. Other successful instances are: the Medical Humanities, also known as the Bio-humanities; the Neural humanities; and Evolutionary Humanities. The Public Humanities are also fairly popular and have spawned the Civic Humanities; the Community Humanities; the Translational Humanities; the Global Humanities; and the Greater Humanities. More neo-liberal variations are the Interactive Humanities and the Entrepreneurial Humanities.

The Digital Humanities (Hayles, 1999, 2005), which are also called the computational, informational and data humanities, are possibly the most powerful institutional developments of recent decades.

Such as rapid growth rate has already prompted several meta-discursive analyses, which in turn have resulted in another sequence of neo-logisms. For instance: the Posthumanities (Wolfe, 2010); inhuman humanities (Grosz, 2011); transformative (Epstein, 2012); emerging and nomadic humanities (Stimpson, 2016) and my critical transversal Posthumanities.

The Posthumanities share a number of assumptions, beyond a mere focus on non-human objects of enquiry. Firstly, that the knower – the knowing subject – is neither Man - homo universalis - nor Anthropos alone. The knowing subject is no longer the liberal individual, but a more complex transversal ensemble of zoe/geo/techno-related factors, which include humans, as collaboratively linked to a material web of human and non-human agents. For instance, the subject of knowledge for the digital humanities is AI-mediated; for the environmental humanities it is geo-, meteo- and hydro-centred.

Let me stress this point: whereas most techno-scientific posthumanists (Latour 2017) dispense with the need for a notion of the subject, replacing it with an inhuman kind of rationalism, I take the opposite view and argue very strongly for a vision of the posthuman subjects that is worthy of our times. The Posthumanities are not born by spontaneous generation, or by automatic replication of dominant meta-patterns: if they exist at all, it is because of the hard work and commitment of communities of thinkers, scholars and activists, who are intervening to either reconstitute or repurpose the missing links between cognitive capitalism and academic knowledge practices. They form alternative collective assemblages, transversal subjects that, through collective praxis, become a new ‘we’, a missing people.

These transversal subjectivities, composed in the mode of eco-sophical assemblages that include non-human actors, stress the grounded, situated and perspectivist dimension of knowledge. Affirmative ethics is what binds them, by composing transversal subject assemblages that actualize the unrealized or virtual potential of what ‘we’ are capable of becoming. Posthuman subjects are a work-in-progress: they emerge as both a critical and a creative project within the posthuman convergence along post-humanist and post-anthropocentric axes of interro-

gation. Their heterogeneity pre-empts any predetermined outcome for the process of composition of new subjects of knowledge: what they may become is a matter of relational alliances and on-going material practices. This is no relativism, but rather immanent neo-materialism and situated perspectivism. I argued above that living entities are both embedded and embodied, and have relational and affective powers. As such they are capable of different things and different speeds of becoming (Braidotti, 2002).

A second crucial feature of the Posthumanities therefore is that they assert the diversity of *zoe* – non-human life – in a non-hierarchical manner that acknowledges the differential intelligence of matter and the respective degrees of ability and creativity of all organisms. *Zoe-geo-techno* entities are partners in knowledge production, which means that thinking and knowing are not the prerogative of humans alone, but take place in the world. That world is defined by the coexistence of multiple organic species, computational networks and technological artefacts alongside each other (Guattari, 2000; Alaimo, 2010).

This emphasis allows the inclusion in education of non-anthropomorphic elements, be it animals, natural entities or technological apparatus. *Zoe-geo-techno* transversal entities allow us to think across previously segregated species, categories and domains. Post-constructivist, transversal method facilitates links to animality, to algorithmic systems, to planetary organisms, on equal, but rhizomic, terms that involve territories, geologies, ecologies and technologies of survival. It relocates both students and educators into the very world they are trying to learn about.

What is critical about the Posthumanities is a question of thematic, methodological and conceptual aspects. Thematically, as stated above, they include non-anthropomorphic objects of study, including networked technological apparatus and big data sets. Methodologically, the defining feature of the Posthumanities is their transversal and post-constructivist character. Conceptually they function through multiple forms of relation and cross-hybridization. They overcome the vision of a de-naturalized social order that is somehow disconnected from its environmental and organic foundations and enact a set of *zoe/geo/techno*-mediations that entail qualitative and methodological shifts of perspective.

Taking a mainstream academic location, one could say that the Posthumanities are a reaction to the epistemic acceleration of cognitive capitalism. They provide insti-

tutional answers to the posthuman convergence, within the contemporary neo-liberal governance of universities, which encourages academic research to reach out for external encounters with a broad spectrum of corporate, civic, public, artistic and activist venues. They support an array of research, development and experimentation with new ways of producing knowledge. These developments are therefore resonating with the mainstream developments of advanced capitalism.

But at least two kinds of knowledge economies are at work in the posthuman convergence. The first is contiguous with the epistemic accelerationism of advanced capitalism (Braidotti, 2019) at the service of dominant or 'Major science' (Deleuze and Guattari, 1994). The second engages with minorities, involving an affirmative diversity of knowledge traditions or 'minor nomad sciences'. The relationship between these qualitatively distinct practices is neither binary nor dialectical, but is constituted by constant negotiations and contestations. Their dynamic and often antagonistic interaction fuels the immense energy of the fast-growing field of the Posthumanities.

Both these - reactive and active - aspects of the Posthumanities need to be taken into account, like two sides of a coin. But it is important to be able to tell the difference between Majority-driven and minorities-inspired modes of posthuman knowledge production (Braidotti, 2018). The latter takes knowledge production as a set of heterogeneous assemblages (Deleuze and Guattari, 1994), fuelled by the desire to actualize post-disciplinary modes of epistemic relations (Lykke, 2011).

Both the Environmental and the Digital humanities clearly display these two meta-patterns. On the side of Majoritarian formations, identical with and supportive of neo-liberal economics, we will encounter the dominant institutional narratives and practices. As indicated above, these tend to combine analytic post-humanism with normative neo-humanism. Examples of this approach are corporate ideas of sustainability, which embrace the Anthropocene and connect to disciplines as wide-ranging as comparative literature, demographics, anthropology, geology, climate and environmental sciences. They constitute an assemblage that gets recoded outside the traditional faculties of the humanities, as the Environmental Humanities. The field is well-funded in research, and it has several specialized scholarly journals and has come to function as an established academic discipline⁽¹⁾. At the same time, the minority-driven forces are doing

very well too, as evidenced by the emergence of critical eco-feminism, radical environmentalism, media and art activism, as well as post- and decolonial theories, indigenous philosophies and practices and other alternative visions of the environmental agenda. These Environmental Humanities are more inclusive and social-minded areas of enquiry.

Even more striking is the case of the Digital Humanities, which display heterogeneous sources that range from brain research, linguistics and robotics, to media studies, librarianship and the application of computing methods to the humanities. In the mainstream model, most of these applications concern the development of digitized archives, concordances and other such resources. They run in parallel to commercial consumer applications, which capitalize on the data exacted from people's intimate lives and experiences. The field of the Digital Humanities has become so advanced that it can boast at least six specialized journals, its own advanced companion, and an international network of institutionalized centres (Schreibman, Siemens and Unsworth, 2004)⁽²⁾.

But this Majoritarian meta-pattern is not all there is. On the side of minority-driven activities, for instance, the digital humanities encompass multiple communities of artists, active citizens, activists of all kinds and denominations (including a sizable right-wing political component). Citizen science and citizen journalism (Blaagaard 2018) are significant examples of another way of approaching the digital humanities.

In other words, the dominant meta-pattern driven by the speed of reterritorialization of neo-liberal economics, and thus limited by it, is not the full picture. Saturation by capital does not exhaust the potential of the Environmental, the Digital, or of any other Posthumanities. There is another way of approaching the phenomenon, which points to both the methods and the ethical aspirations of their critical powers. This approach stresses the transversal force of the Posthumanities as a constitutive flow of supra-disciplinary discourses indexed on the expression of the perspectives and values of a diverse range of knowing subjects and knowledge practices. 'We' – critical posthuman thinkers – are capable of sustaining affirmative assemblages, knowing that their political force lies in actualizing affirmative relations

and collective imaginings (Gatens and Lloyd 1999). By extension, transdisciplinary, interdisciplinary and post-disciplinary scholars have expertise and know-how without necessarily being (recognized as) disciplinary experts, or in spite of what they may know about the limitations of those disciplines. Marginal knowledge is dynamic, vital and unruly in its very aspirations to change the rules of the game.

The emphasis on vital neo-materialism, which provides the ontological grounding for critical posthuman scholarship as a transversal field of knowledge, is also a way to resist the business model of neo-liberal higher education. Posthuman transversality was developed (Cole and Bradley, 2018) as an organizational principle that criticizes this pyramidal academic structure and the hierarchical chain of command at the core of most institutions of higher learning. It also calls into question the role of capital in higher education designed as a global market, and the unequal labour relations it engenders, with a vast "precariat" at the bottom of the academic scale. For most participants, the reality of an academic education today is a high debt and under-employment. Practices of community-driven 'transversality' are the antidote to the corporatization of universities and the monetarisation of knowledge, in that they introduce a non-hierarchical model of relationality and the gratuity of affect in education. As Åsberg, (Åsberg, Koobak and Johnson, 2010) and Lykke (2018) suggest, new institutional modes and methods of organizing posthuman knowledge need to unfold in transversal conversations, through collaborative, shareable academic spaces, where community work can be enacted in a non-competitive frame.

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Planetary Differential Posthumanities

I am now reaching the final stage of my argument, namely that the Critical Posthumanities, by tracing a different mode of relational subjectivity, through the praxis of affirmative ethics, help us to compose a new hetero-

1. See the two major ones: <http://environmentalhumanities.org/>; <http://www.resiliencejournal.org/>

2. This is the CenterNet Network that publishes the Digital Humanities Commons: <http://www.dhcenternet.org/>

geneous community, as a virtual project, or a “missing people”. That is to say a: “we-are-in-this-together-but-we-are-not-one-and-the-same” kind of people. This is a subject that acknowledges it is intertwined with the totality of things – including zoe/geo/techno “things”. A subject that aspires to compose missing alliances and relations by actively working towards the creation of milieus and planes of encounter. A people in the process of becoming not One is a complex multiplicity held together by shared ethical passions for and a social imaginary supportive of affirmative alternatives.

Old power relations persist in the new world order. What are we to make, for instance, of the fact that so few institutional organizations have emerged around the Minor discourses by emerging ‘missing people’? These are: Non-nationally Indexed Humanities; Feminist/Queer Humanities; Black Humanities; Migrant/Diasporic Humanities; Poor/Trailer Park Humanities; De-colonial Humanities; A Child’s Humanities; Otherwise-abled/Disabled Humanities. Some of these communities were already empirically missing. Whether we look at women and LGBTQ+, indigenous knowledge systems, at queers, otherwise enabled, trailer-parks, non-humans or technologically mediated existences, these are real-life subjects whose knowledge never made it into any of the official cartographies. Their struggle for visibility and emergence also affects the knowledge they are capable of generating.

Fortunately, the energy of the minorities is already providing answers: the strength of minoritarian subjects consists of their capacity to carry out alternative modes of becoming and transversal relations that break up segregational patterns. New border-crossings are being set up that aim to actualize the virtual knowledges and visions of these missing peoples. Different assemblages are being formed, along the convergence of posthumanism & post-anthropocentrism, but adding in the social, ethical and political dimensions. They follow an encounter between feminist, LGBTQ+ and gender studies; postcolonial, de-colonial and indigenous studies; critical legal studies; media activists; hackers and makers; and First national land rights activists. For instance, since Rob Nixon’s seminal work on slow violence (2011), the missing links between postcolonial theories, the Environmental Humanities and indigenous epistemologies have been exposed and analysed, resulting in growing convergence between them.

The strength of minoritarian subjects consists of their capacity to carry out alternative modes of becoming and transversal relations that break up segregational patterns

At the level of the political economy of the Posthumanities, this leads on to the production of new areas of studies that cross over the convergence that constitutes the post-human turn. See for instance: Indigenous Environmental and Digital Humanities; Postcolonial Green; Decolonial Futures of Digital Media; Transnational Environmental literary studies; Queer neo-humanisms; and Indigenous knowledges and cosmologies.

Similar developments are on the way to fill in missing links in the Digital Humanities. For instance, relying on the work of pioneers like Lisa Nakamura (2002), Ponzanesi and Leurs (2014) claim that Postcolonial Digital Humanities are now a fully constituted field, digital media providing the most comprehensive platform to re-think transnational spaces and contexts. Mignolo’s decolonial movement has struck new alliances between Environmentalists and Legal specialists, Indigenous and non-western epistemologies, First Nation peoples, new media activists, IT engineers and anti-globalization forces. They have produced the Decolonial Digital Humanities and the Trans-national Justice movement.

But the other missing people are the virtual ones, those that can emerge only as the result of a neo-materialist assemblage through the praxis of affirmation. This composition requires affective and relational alliances that go beyond identity claims, not by denying them, but by expanding them into diversified embedded & embodied materialist platforms of different “missing people”.

The transversal alliance of the missing people today is technologically mediated and it always involves non-human agents (land, water, plastic, wires, information highways, algorithms, etc.). New border-crossings are being set up that aim to actualize the virtual knowledges and visions of these missing peoples.

The Critical Posthumanities are in constant process, inter-breeding through multiple alliances, topics and missing links. Which does not mean that anything goes, but rather that rhizomic multi-directionality is the rule.

See for instance the intersection of the ‘classical’ Environmental Humanities and indigenous epistemologies; the Postcolonial Environmental Humanities; the Postcolonial Digital Humanities; Decolonial Futures of Digital

Media; Transnational Environmental literary studies; and indigenous perspectivism. These recent developments, as well as the lasting legacy of the critique of racialized ontologies (Wynter, 2015), of Black neo- and posthumanism (Gilroy, 2016) and indigenous philosophies (Todd, 2015; Whyte, 2016) cast important new insights upon knowledge production within the posthuman convergence.

Conclusion

Considering the wealth and diversity of knowledge production within the Posthumanities, we should avoid any hasty reconstructions of 'Humanity'. The focus must remain on the differential politics of location in our globalized, technologically mediated and ethnically diverse world, and how they affect the production of knowledge. "We" – the dwellers on this planet at this point in time – are confronted by a number of painful contradictions: an electronically linked pan-humanity that is, however, more fragmented than ever and split by violent internal fractures, xenophobic fears and violence. Humanity is re-created as a negative category, held together by shared vulnerability and the spectre of extinction, but also struck down by environmental devastation, by new and old power relations. We must beware of re-compositions of corporate humanism and its opportunistic moralistic rhetoric.

The focus must remain on the differential politics of location in our globalized, technologically mediated and ethnically diverse world, and how they affect the production of knowledge

Starting from philosophies of radical immanence, vital materialism and the feminist politics of locations, I want to argue against taking flight into an abstract idea of a "new" pan-humanity, bonded in shared vulnerability or anxiety about survival and extinction. What we need instead is embedded and embodied, relational and affective cartographies of the new power relations that are emerging from the current geo-political and post-anthropocentric world order. Class, race, gender and sexual orientations, age and able-bodiedness are more than ever significant markers of human "normality." They are key factors in framing the notion of and policing access to something we may call "humanity".

Yet, considering the global reach of the problems we are facing today, in the posthuman convergence, it is the case that "we" are indeed in this anthropocenic crisis together. Such awareness must not however obscure or flatten out the power differentials that sustain the collective subject ("we") and its endeavor (this). It may be more useful to work toward multiple actualizations of new transversal alliances, communities and planes of composition of the human: many ways of becoming-world together. In this respect the Posthumanities are giving us a measure of what we are actually in the process of becoming.

References

- Alaimo, Stacy. (2010). *Bodily Natures: Science, Environment, and the Material Self*. Bloomington, IN: Indiana University Press.
- Åsberg, Cecilia, Koobak, Redi and Johnson, Ericka (eds). (2010). Post-humanities is a feminist issue. *Nora*, 19(4), 213–16.
- Beck, Ulrich. (2007). The cosmopolitan condition: Why methodological nationalism fails. *Theory, Culture & Society*, 24(7/8), 286–90.
- Blaagaard, Bolette. (2018). *Citizen Journalism as Conceptual Practice: Postcolonial Archives and Embodied Political Acts of New Media*. London and New York: Rowman & Littlefield.
- Braidotti, Rosi. (1991). *Patterns of Dissonance: On Women in Contemporary French Philosophy*. Cambridge: Polity.
- Braidotti, Rosi. (2002). *Metamorphoses: Towards a Materialist Theory of Becoming*. Cambridge: Polity.
- Braidotti, Rosi. (2006). *Transpositions: On Nomadic Ethics*. Cambridge: Polity.
- Braidotti, Rosi. (2011). *Nomadic Subjects: Embodiment and Sexual Difference in Contemporary Feminist Theory*. New York: Columbia University Press.
- Braidotti, Rosi. (2013). *The Posthuman*. Cambridge: Polity.
- Braidotti, Rosi. (2016a). The contested posthumanities. In: Rosi Braidotti and Paul Gilroy (eds.) *Contesting Humanities*. London: Bloomsbury Academic.
- Braidotti, Rosi. (2016b). The critical posthumanities; Or, Is medianatures to naturecultures as Zoe is to Bios? *Cultural Politics*, 12(3), 380–90.

- Braidotti, Rosi. (2017). Posthuman, all too human. *The 2017 Tanner Lectures on Human Values*. Utah: Whitney Humanities Center, Yale University and the Tanner Foundation.
- Braidotti, Rosi. (2018). A theoretical framework for the critical posthumanities. *Theory, Culture & Society*, <https://doi.org/10.1177/0263276418771486>.
- Braidotti, Rosi. (2019). *Posthuman Knowledge*. Cambridge: Polity.
- Braidotti, Rosi and Bignall, Simone (eds). (2018). *Posthuman Ecologies*. London: Rowman & Littlefield International.
- Braidotti, Rosi and Hlavajova, Maria (eds). (2018). *Post-human Glossary*. London: Bloomsbury Academic.
- Castells, Manuel. (2010). *The Information Age: Economy, Society and Culture. Volume 1: The Rise of the Network Society*, 2nd edn. Oxford: Wiley-Blackwell.
- Citton, Yves and Frédéric Lordon. (2008). *Spinoza et les sciences sociales*. Paris: Editions Amsterdam.
- Cole, David R. and Bradley, Joff P.N. (eds). (2018). *Principles of Transversality in Globalization and Education*. New York: Springer.
- Cooper, Melinda. (2008). *Life as Surplus: Biotechnology and Capitalism in the Neoliberal Era*. Seattle, WA: University of Washington Press.
- Deleuze, Gilles. (1988). *Spinoza: Practical Philosophy*. San Francisco: City Lights Books.
- Deleuze, Gilles and Guattari, Félix. (1987). *A Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis, MN: University of Minnesota Press.
- Deleuze, Gilles and Guattari, Félix. (1994). *What is Philosophy?* New York: Columbia University Press.
- Descola, Philippe. (2009). Human natures. *Social Anthropology*, 17(2), pp. 145-57.
- Descola, Philippe. (2013). *Beyond Nature and Culture*. Chicago: University of Chicago Press.
- Epstein, Mikhail. (2012). *The Transformative Humanities: A Manifesto*. London: Bloomsbury Academic.
- Flannery, Tim. (1994). *The Future Eaters*. New York: Grove Press.
- Foucault, Michel. (1970). *The Order of Things: An Archaeology of Human Sciences*. New York: Pantheon Books.
- Foucault, Michel. (1995). *Discipline and Punish*. New York: Pantheon Books.
- Fraser, Caroline. (2009). *Rewilding the World: Dispatches from the Conservation Revolution*. New York: Metropolitan Books.
- Gatens, Moira and Lloyd, Genevieve. (1999). *Collective Imaginings*. New York: Routledge.
- Gilroy, Paul. (2016). *The Black Atlantic and the Re-enchantment of Humanism*. Salt Lake City, UT: University of Utah Press.
- Grosz, Elizabeth. (2011). *Becoming Undone: Darwinian Reflections on Life, Politics, and Art*. Durham, NC: Duke University Press.
- Guattari, Félix. (2000). *The Three Ecologies*. London: Athlone Press.
- Hayles, N. Katherine. (1999). *How We Became Post-human: Virtual Bodies in Cybernetics, Literature and Informatics*. Chicago, IL: University of Chicago Press.
- Hayles, N. Katherine. (2005). *My Mother Was a Computer: Digital Subjects and Literary Texts*. Chicago, IL: University of Chicago Press.
- Hörl, Erich. (2018). General ecology. In: Rosi Braidotti and Maria Hlavajova (eds.) *Posthuman Glossary*. London: Bloomsbury Academic, pp. 172–4.
- Kolbert, Elizabeth. (2014). *The Sixth Extinction*. New York: Henry Holt Company.
- Latour, Bruno. (2017). *Facing Gaia: Eight Lectures on the New Climatic Regime*. Cambridge: Polity.
- Lloyd, Genevieve. (1984). *The Man of Reason: Male and Female in Western Philosophy*. London: Methuen.
- Lloyd, Genevieve. (1994). Part of Nature: Self-Knowledge In Spinoza's Ethics. Cornell University Press.
- Lykke, Nina. (2011). This discipline which is not one: Feminist studies as a post-discipline. In: Nina Lykke, Rosemarie Buikema and Gabriele Griffin (eds.) *Theories and Methodologies in Postgraduate Feminist Research: Researching Differently*. New York: Routledge, 137–51.
- Lykke, Nina. (2018). Postdisciplinarity. In: Rosi Braidotti and Maria Hlavajova (eds.) *Posthuman Glossary*. London: Bloomsbury Academic, pp. 332–5.
- Mbembe, Achille. (2003). Necropolitics. *Public Culture*, 15(1), 11–40.

- Mignolo, Walter. (2011). *The Darker Side of Western Modernity: Global Futures, Decolonial Options*. Durham, NC: Duke University Press.
- Minteer, Ben A. (2018). *The Fall of the Wild: Extinction, De-Extinction, and the Ethics of Conservation*. New York: Columbia University Press.
- Monbiot, George. (2013). *Feral: Searching for Enchantment on the Frontiers of Rewilding*. London: Allen Lane.
- Moore, Jason. (2013). *Anthropocene, Capitalocene, and the myth of industrialization*. *World-Ecological Imaginations: Power and Production in the Web of Life*, 16 June. Available at: <https://jasonwmoore.wordpress.com/2013/06/16/anthropocenecapitalocene-the-myth-of-industrialization/>.
- Moulier-Boutang, Yann. (2012). *Cognitive Capitalism*. Cambridge: Polity.
- Nakamura, Lisa. (2002). *Cybertypes: Race, Ethnicity and Identity on the Internet*. New York: Routledge.
- Nixon, Robert. (2011). *Slow Violence and the Environmentalism of the Poor*. Cambridge, MA: Harvard University Press.
- Ponzanesi, Sandra and Leurs, Koen. (2014). Introduction to the special issue: On digital crossings in Europe. *Crossings, Journal of Migration and Culture*, 4(1), 3–22.
- Rajan, Kaushik Sunder. (2006). *Biopolitical: The Constitution of Postgenomic Life*. Durham, NC: Duke University Press.
- Rose, Nikolas. (2007). *The Politics of Life Itself*. Princeton, NJ: Princeton University Press.
- Rose, Nikolas. (2013). The human sciences in a biological age. *Theory, Culture & Society*, 30(1), 3–34.
- Schreibman, Susan, Siemens, Ray and Unsworth, John. (2004). *A Companion to Digital Humanities*. Oxford: Blackwell.
- Schwab, Klaus. (2015). The fourth industrial revolution. *Foreign Affairs*, 12 December.
- Shiva, Vandana. (1997). *Biopiracy: The Plunder of Nature and Knowledge*. Boston, MA: South End Press.
- Srnicek, Nick. (2016). *Platform Capitalism*. Cambridge: Polity.
- Stimpson, Catherine. R. (2016). *The nomadic humanities*. Los Angeles Review of Books, 12 July.
- Todd, Zoe. (2015). Indigenizing the Anthropocene. In: Heather Davis and Etienne Turpin (eds.) *Art in the Anthropocene: Encounters Among Aesthetics, Politics, Environments and Epistemologies*. London: Open Humanities Press, pp. 241–54.
- Verbeek, Peter Paul. (2011). *Moralizing Technology: Understanding and Designing the Morality of Things*. Chicago: University of Chicago Press.
- Viveiros de Castro, Eduardo. (1998). Cosmological deixis and Amerindian perspectivism. *The Journal of the Royal Anthropological Institute*, 4(3), pp. 469–488.
- Viveiros de Castro, Eduardo. 2009. *Cannibal Metaphysics: For a Post-structural Anthropology*. Minneapolis: Univocal Publishing.
- Waal, Frans de. (2009). *The Age of Empathy*. New York: Three Rivers Press.
- Whyte, Kyle P. (2016). Is it colonial déjà vu? Indigenous peoples and climate injustice. In: Joni Adamson, Michael Davis and Hsinya Huang (eds.) *Humanities for the Environment: Integrating Knowledges, Forging New Constellations of Practice*. Abingdonon- Thames: Earthscan Publications, pp. 88–104.
- Wolfe, Cary. (2010). *What is Posthumanism?* Minneapolis, MN: University of Minnesota Press.
- Wynter, Sylvia. (2015). *On Being Human as Praxis*. Durham, NC: Duke University Press.
- Zuboff, Shoshana. (2019). *The Age of Surveillance Capitalism*. New York: Hachette.

6. What added value can be offered by people with humanistic training that are engaged in scientific and technological development projects? Likewise, what added value can be offered by scientists and technologists that are working in humanistic development?

At the Interface of Biology and Humanities: Archaeogenetics and the New View of the Past

Carles Lalueza-Fox

Abstract

In recent years, new sequencing technologies have generated numerous human genomes from the past and the amount of such data is now growing exponentially, directly placing information on the ancestry of ancient humans in specific chronological and cultural horizons. This type of information allows us to not only determine the extent and magnitude of past migrations, but also to answer questions on such matters as individual sex determination, kinship analysis in burial sites, social organization and even sex biases in population movements. All these questions, which are central to the interests of humanities researchers, were seemingly impossible to answer until now. Therefore, the emerging field of archaeogenetics constitutes a unique opportunity to establish a truly multidisciplinary view of the reconstruction of the past. To generate truly collaborative efforts among geneticists, archaeologists and even historians, we propose the establishment of new “archaeo-science” programs that could train students in these different academic disciplines.

most of the genotyped samples are currently accumulated, no doubt the wave of archaeogenetics will move towards all continents in the next years, generating a similar intellectual tsunami to that experienced in European prehistory and challenging previous assumptions about many periods and regions.

In recent years, the massive availability of genomic data generated from ancient human remains has revolutionised the study of the past, until now restricted to disciplines of Humanities such as History and Archaeology

Geneticists may be viewed by humanistic researchers as newcomers to the study of the human past; this is of course true, but they should know that they are here to stay. Some decades ago, the invention of radiocarbon dating similarly shook the archaeological field, especially when some dates were in conflict with those that were widely accepted by the humanistic community. If a lesson can be learned from the previous experience, it is that a defensive corporate attitude is not the right way to deal with the current challenge.

Some archaeologists have criticized archaeogeneticists for being “bewitched by grand intellectual narratives” and yet, some of the potential information generated by genetics has always been at the core of humanistic interests, including evidences for migrationism versus diffusionism, sex biases, past inequality, family relationships within sites or individual stories. I am going to provide some illustrative examples of these cases in the interface of genetics, archaeology and history.

Introduction

In recent years, the massive availability of genomic data generated from ancient human remains has revolutionised the study of the past, until now restricted to disciplines of Humanities such as History and Archaeology. This has been fuelled by the emergence of second generation sequencing technologies in the last decade, which have allowed not only the retrieval of complete genomes from other human species such as Neanderthals and Denisovans⁽¹⁻²⁾ but also the genotyping of an increasingly large number of human samples derived from a wide range of cultural horizons and geographical regions. For instance, a single paper published at Science in 2019 dealt with the genetic analysis of more than 400 ancient individuals only in the Iberian Peninsula⁽³⁾. Although Europe is where

Migration versus cultural diffusion

The main objective so far of large-scale paleogenomic studies has been to reconstruct past population move-

1. Green et al. 2010.
2. Reich et al. 2010.
3. Olalde et al. 2019.

ments and try to correlate the changes in the genetic substratum with archaeological horizons⁽⁴⁻⁵⁻⁶⁻⁷⁾. The possibility of analysing people who were buried in specific funerary contexts means we can test previous hypotheses of migration versus cultural diffusion that in some cases have entailed considerable debates in Humanities.

At the beginning of the 20th century, the interpretation of the past was based on notions of large-scale and long-distance population movements having an impact on other regions and modifying their cultures⁸. This interpretative framework was associated to political support for nationalistic and colonial views and was even connected with Nazi archaeology prior to the Second World War⁽⁹⁾.

In the second half of the 20th century, the archaeological community reacted against the “migrational” views of the past and placed more importance on indigenous cultural evolution⁽¹⁰⁾. This debate not only relates to prehistoric periods, where evidence can be dispersed and scant, but also in more recent contexts such as the fall of the Roman Empire, where some scholars have recently supported a significant role of migrations in the period⁽¹¹⁾. Since the 1970s the emergence of molecular studies along with statistical models, pioneered by the work of Cavalli-Sforza, have placed new emphasis on population movements such as the demic diffusion associated to the spread of agriculture⁽⁹⁾.

Recent archaeogenetic studies seem to have tipped the scales towards a view of the past again dominated by migrations, much to the dismay of some scholars. Several studies now demonstrate that agriculture represented a large population replacement in Europe but also that the continent was subsequently shaken by a migration of nomads from the steppes⁽⁶⁾. The latter, starting about 5,000 years ago and spreading into the rest of Europe over the next 1,000 years, is so large in scale that it has also been associated to the arrival of Indo European languages. Additional analysis of a large number of Central Asian samples, as well as some from the periphery of the Indus, also relates the arrival of

steppe ancestry in the Indian subcontinent about 3,500 years ago to the Indo-Arians that substantially modified the Indian genetic composition. This arrival of foreign people likely introduced Sanskrit -another Indo-European language- and established the caste system⁽¹²⁾.

These large migrations can be used to explore yet another level of complexity in the interface of genetics and Humanities that has yet to be fully explored: language replacement and spread. Languages are at the very root of cultural and group identity and their substitution is undoubtedly another important component of the social changes associated to genetic impact.

Despite what may seem to be the case, not all genetic results tell the same story and support the migration paradigm. In a seminal study of four hundred Copper-Bronze Age samples from the so-called Bell Beaker complex, a distinctive cultural horizon that spread from Iberia into most of Europe between 4,750 and 4,500 years ago⁽⁷⁾, it was possible to conclude that it was a movement of ideas in first instance, to become, later on, a movement of people. For instance, a “reflux” movement of people with the Bell Beaker archaeological package from Central Europe into the British Isles clearly involved the almost complete replacement of the previous Neolithic substratum⁽⁷⁾.

This study illustrates the complexity of past population movements and the need for further integration from different disciplines in order to understand them, not only at the genetic level, but also their social and cultural consequences.

Sex determination

Until recently, skeletal remains were sexed by studying morphological indications associated to the fact that, on average, males have larger and more robust bones than females. In forensics, the molecular tool used for sexing samples is based on the observation that the amelogenin gene is 6bp shorter in the X-chromosome than in its male counterpart. As females carry two copies of the X-chromosome and males only one (because they are XY) this means the latter could be distinguished by a double-band in a polymerase chain reaction (PCR) experiment. However, working with highly degraded ancient DNA, the amelogenin approach proved to be unreliable due to problems associated to allelic dropout, external contamination and fragmentation of the original DNA.

12. Narasimhan 2018.

4. Lazaridis et al. 2014.

5. Allentoft, et al. 2015.

6. Haak et al. 2015.

7. Olalde et al. 2018.

8. Childe 1925.

9. Ammerman and Cavalli-Sforza 1984.

10. Clark 1966.

11. Heather 2010.

Second generation sequencing techniques have solved the previous limitations for sexing archaeological remains by estimating the ratio of reads mapping to each sexual chromosome⁽¹³⁾ or the ratio of X chromosome reads versus the autosomal coverage in the same individual⁽¹⁴⁾. Reliable knowledge of the sex of skeletal remains can be crucial for archaeological interpretation in specific contexts. Probably the most illustrative case of this is the famous Upper Paleolithic triple burial from Dolní Věstonice in the Czech Republic, dated to around 31,000 years ago⁽¹⁵⁾. The burial of the three individuals (labelled DV13, DV15 and DV14) is especially intriguing for a number of reasons: DV13 (which corresponds to a male teenager) had a thick wooden pole driven through his hip and his hands on the pubic region of the central individual, DV15. Flanking this, a second male teenager, DV14, is buried face-down. The central individual, who was obviously of preeminent status had been ascribed to both male and female sex¹⁶ due to a pathological condition affecting the curvature of the spine, the pelvis and the teeth⁽¹⁷⁾.

Genomic data generated from the three individuals showed that the middle individual (in fact, all three) was a male⁽¹⁴⁻¹⁵⁾. This necessarily rules out some of the previous interpretations, such as the middle individual dying during childbirth⁽¹⁶⁾ and suggests a different one based on a possible, tragic “love triangle”.

In conclusion, genetic data offers for first time large-scale and accurate sex determination of skeletal remains in a funerary context, which in turn represents a step forward in the archaeological interpretation of such contexts.

Kinship analysis

An understanding of the kin relationships within sites has always been one of the major goals of archaeological research because it is such a significant principle of social organization. However, the results have been contentious due to the problem of attributions being grounded on anthropological evidence alone. New genomic evidence from ancient remains is now providing, for first time, uncontroversial evidence of first

and second-degree -and sometimes even more distant family relationships from the archaeological record.

As the number of ancestors doubles with each generation, the amount of genetic material on those ancestors is divided by half. Thus, each of our parents have contributed 50% to our genome, each of our four grandparents 25%, etc. Siblings also share 50% of their genome. With enough genomic data, it is now possible to estimate the degree of relatedness between any given pair of individuals (first degree relatives share 50% of genetic variation in any given chromosome, second degree relatives 25%, etc.). It is also possible to distinguish between parent-offspring and siblings; in the first case, the 50% identity runs continuously along each chromosomal arm -because each parent has contributed a whole chromosomal copy- and in the second case, the 50% identity runs in discrete chromosomal blocks. Differences in the mitochondrial DNA (which is inherited exclusively from the maternal side and can thus be different in the parent-offspring case) can also help to distinguish between both scenarios.

This approach could be used to show that two Mesolithic skeletons found in a cave in La Braña-Arintero (León, Spain), high in the Cantabrian mountains and dated to about 8,000 years ago, were in fact brothers⁽¹⁸⁻¹⁹⁾. The same approach helped to discard the possibility that the two teenagers interred head-to-head at the iconic double burial from Sunghir (Russia), dated to 35,000 years ago, were closely related⁽²⁰⁾.

Perhaps one of the most illustrative examples of kinship being reconstructed from genetics comes from a 5,000-year-old mass grave from Koszyce (Poland) belonging to the Globular Amphora culture⁽²¹⁾. The burial pit contained the bodies of 15 people, including children, women and men, with evidence of them having been executed by blows to the head, possibly by Corded Ware groups that were associated to the Yamnaya expansion into Europe. The kinship analysis demonstrated that the dead belonged to an extended family group who were arranged in close proximity according to their kinship to each other. Therefore, they were likely buried by people who knew them. Interestingly, there are no male parents among the deceased, so maybe they were away from the village during the raid.

13. Skoglund et al. 2013.

14. Mittnik et al. 2016.

15. Fu et al. 2016.

16. Klima 1988.

17. Formicola & Pontrandolfi 2001.

18. Olalde et al. 2014.

19. Olalde et al. 2019.

20. Sikora et al. 2017.

21. Schroeder et al. 2019

Social organization

One consequence of unravelling relatedness among individuals within and between sites is the possibility to gain insights into the social and reproductive behaviour of past cultures. For instance, the lack of close inbreeding among Sunghir Upper Palaeolithic individuals⁽²⁰⁾ as opposed to the genetic signals of both endogamy⁽²²⁾ and even consanguinity among Neanderthals⁽²³⁾ has been employed to explain a potential adaptive advantage of anatomically modern humans.

At historical scales, archaeogenetics is shedding light on social differences in funerary contexts. For instance in a recent analysis of two Longobard necropolises from Italy and Hungary, it was possible to uncover the family links –mainly in the paternal line– between some of the graves that showed signs of social status⁽²⁴⁾. The Longobard were a Barbarian group that invaded the late Roman Empire and established themselves in Italy in the 6th century CE. The authors of the study also found that those individuals with more Central or Northern European ancestry were buried with richer grave goods such as weapons or jewels. In contrast, people of local ancestry were very often buried in a poor funerary context⁽²⁴⁾. This type of study will undoubtedly become more common in the near future and we will therefore learn more information about past inequalities. One can argue that social organization is one of the main goals of historical and archaeological reconstruction; now, for first time, this goal is achievable and testable at the genetic level.

Sex biases

Having ancient genomes also makes it possible to trace the arrival of populations with distinct genomic backgrounds and reconstruct past migrations. Not only this, the correlation of these data with uniparental markers (those inherited only from one or another of our parents, the mitochondrial genome in the case of the female line and the Y-chromosome in the case of males) can make gender-biased migrations visible. Also, as the X-chromosome gene-pool is carried by two thirds of women and only one third of men at any given moment (in populations where the female-male ratio is equal) that means that we can also explore whether a migration

was male-driven by exploring the fraction of a specific ancestry in the X-chromosomes as compared to the autosomes in the same individual.

We now have evidence that some of the most important population movements into Europe, like the one triggered by the arrival of the steppe nomads in the Copper Age, were strongly sex-biased. In a recent analysis of Iberian individuals from the Bronze Age that were alive in the steppe ancestry contact period⁽¹⁹⁾ it was found that X-chromosomes showed half the steppe ancestry ratio detected in the autosomes of the same individuals (17.3% to 38.9%), thus indicating that the genetic change was driven by incoming males. An illustrative example of this process was found at a Bronze Age Iberian site called Castillejo del Bonete (Ciudad Real) where a couple were found to be buried; the male had steppe ancestry while the female –who ate a maritime diet according to isotopic analysis– did not⁽¹⁹⁾. This means the woman must have come from the coast, which is at least 250 km away from the site.

All these ways of looking at the genomics of modern and past populations are providing tools for understanding the dynamics of sex-biased migrations.

Individual stories

Somehow related to the previous section, archaeogenetic studies are also uncovering personal stories of people who in some cases had remarkable lives. We will never know the specific details and yet much can be learned from ancestries that are inconsistent with those of the general population. On a time scale, the accumulation of these individual stories can influence the stream of heredity that constitutes changes to the whole population. In the previously mentioned study on Iberia⁽¹⁹⁾, a single individual of full North African ancestry dated to about 4,400 years ago was found buried in the middle of the Iberian Peninsula, at a site in Madrid called Camino de las Yeseras⁽¹⁹⁾. Moreover, in other historical periods, the same study has uncovered, for instance, the presence of a woman at a 5-6th century CE Visigothic site called Sant Julià de Ramis in Girona (North East Spain) that has clear affinities to Eastern Europe⁽¹⁹⁾ and could correspond to someone who followed the remarkable journey of the Goths from the Eastern borders of the Roman Empire into Iberia. Again, the details will always escape us, but genetics can perfectly track the origins of this individual.

22. Castellano et al. 2014.

23. Prüfer et al. 2014.

24. Amorim et al. 2018.

Conclusions

The reconstruction of human history is a complex enterprise that can only be addressed by multidisciplinary teams⁽²⁵⁾. However, an understanding of the methodologies, as well as the possibilities and limitations, of each field will require a level of communication and interdisciplinarity that is not yet present in the Humanities. So, funding agencies should promote real multidisciplinary teams and reject proposals that consider archaeologists as mere sample providers.

Therefore, strong collaborative efforts will need to be established among geneticists, archaeologists and historians in the future. One suggestion to advance in this direction would be to establish new “archaeo-science” programs that could train students together in these disciplines.

References

- Green, R. E. et al. (2010). A Draft Sequence of the Neanderthal Genome. *Science* 328, pp. 710–722.
- Reich, D. et al. (2010). Genetic history of an archaic hominin group from Denisova cave in Siberia. *Nature* 468, pp. 1053–1060.
- Olalde, I. et al. (2019). The genomic history of the Iberian Peninsula over the past 8000 years. *Science* 363, pp. 1230–1234.
- Lazaridis, I. et al. (2014). Ancient human genomes suggest three ancestral populations for present-day Europeans. *Nature* 513, pp. 409–413.
- Allentoft, M. E. et al. (2015). Population genomics of Bronze Age Eurasia. *Nature*, 522, pp. 167–172.
- Haak, W. et al. (2015). Massive migration from the steppe was a source for Indo-European languages in Europe. *Nature* 522, pp. 207–211.
- Olalde, I. et al. (2018). The Beaker phenomenon and the genomic transformation of northwest Europe. *Nature* 555, pp. 190–196.
- Childe, V. G. (1925). *The Dawn of European Civilization*, Ammerman, AJ and Cavalli-Sforza, LL. (1984). *The Neolithic Transition and the Genetics of Populations in Europe*, Princeton; Princeton University Press.
- Clark, G. (1966). The invasion hypothesis in British archaeology. *Antiquity* 40, pp. 172–189.
- Heather, P. (2010). *Empires and Barbarians; the fall of Rome and the birth of Europe*, Oxford: Oxford University Press.
- Narasimhan, V. M. et al. (2018). The Genomic Formation of South and Central Asia. *bioRxiv*
- Skoglund, P., Storå, J., Götherström, A. & Jakobsson, M., (2013). Accurate sex identification of ancient human remains using DNA shotgun sequencing. *J. Archaeol. Sci.* 40, pp. 4477–4482.
- Mittnik, A., Wang, C. C., Svoboda, J. & Krause, J. A. (2016). Molecular approach to the sexing of the triple burial at the upper paleolithic site of Dolní Věstonice. *PLoS One* 11.
- Fu, Q. et al., (2016). The genetic history of Ice Age Europe. *Nature*, 534, pp. 200–205.
- Klíma, B., (1988). A triple burial from the Upper Paleolithic of Dolní Věstonice, Czechoslovakia, *J. Hum. Evol.* 16, pp. 831–835.
- Formicola, V. & Pontrandolfi, A., (2001). The Upper Paleolithic Triple Burial of Dolní Veřtonice. *Am. J. Phys. Anthropol.* 379, pp. 372–379.
- Olalde, I. I. et al. (2014). Derived immune and ancestral pigmentation alleles in a 7,000-year-old Mesolithic European. *Nature* 507, pp. 225–228
- Olalde, I. et al., (2019). The genomic history of the Iberian Peninsula over the past 8000 years. *Science* 363, pp. 1230–1234.
- Sikora, M. et al., (2017). Ancient genomes show social and reproductive behavior of early Upper Paleolithic foragers. *Science* 662, pp. 659–662.
- Schroeder, H. et al. (2019). Unraveling ancestry, kinship, and violence in a Late Neolithic mass grave, *Proc. Natl. Acad. Sci. USA* 116, pp. 10705–10710
- Castellano, S. et al., (2014). Patterns of coding variation in the complete exomes of three Neandertals. *Proc. Natl. Acad. Sci. USA* 111, pp. 6666–6671.
- Prüfer, K. et al., (2014). The complete genome sequence of a Neanderthal from the Altai Mountains, *Nature* 505, pp. 43–49.
- Amorim, C. E. G. et al., (2018). Understanding 6th-century barbarian social organization and migration through paleogenomics. *Nat. Commun.* 9, p. 3547.
- Lalueza-Fox, C. (2013). Agreements and Misunderstandings among Three Scientific Fields. *Curr. Anthropol.* 54, S214–S220.

25. Lalueza-Fox 2013

Case Study — EpNet Project. From Multi- to Interdisciplinarity: A View from Archaeology

Iza Romanowska

Archaeology is one of the disciplines in humanities that has been most pressed for multidisciplinary approaches. Partially due to the nature of the data and partially because of the general paucity of it, archaeologists have always worked very closely with researchers from outside of their profession to squeeze the most out of the little information there is about ancient societies. We get fellow geomorphologists to look at the soil profiles, osteoarchaeologists to analyse the bones and physicists to date the finds, etc. However, this kind of collaboration often extends no further than a “customer - service provider” type of relationship, in which members of one discipline use their skills and knowledge to provide a service to another, for example, to establish the most probable age of a sample using a particular dating technique. Although useful and necessary, this is hardly a model for ‘transdisciplinarity’.

Throughout this piece the word “multidisciplinarity” is understood as this kind of collaboration - using expertise from other disciplines to perform a specific service such an analysis of a particular type of data. In contrast, the term “inter-” and “transdisciplinary” is used here to mean a much closer and mutually dependent type of working together towards a common goal. An interdisciplinary team aims to work out a problem together by applying, developing and adapting tools from different disciplines in a synthetic manner. This type of collaboration formed the core of a recently concluded ERC-funded EpNet project: “Production and Distribution of Food during the Roman Empire: Economic and Political Dynamics” (ERC-2013-ADG 340828). Led by prof. J. Remesal Rodríguez - the head of the CEIPAC group (CEIPAC 2019) at the Department of History and Archaeology at the University of Barcelona, Spain, it united historians, archaeologists, network scientists and specialists in computer simulation to try to understand how the commerce of foodstuff shaped the economy of the Roman Empire. The ambitious goal was to use the existent archaeological datasets, and in particu-

lar the epigraphic dataset collected over the last two decades by CEIPAC (romanopendata 2019), to validate or reject existing hypotheses regarding the functioning and organisation of Roman trade. The project ran for five years between 2014-2019 and employed over 15 researchers at different stages of their academic careers based at three research institutions: University of Barcelona, Barcelona Supercomputing Center and Siris Academics (Remesal et al. 2015). Here, we present a few ‘lessons learnt’ in the five years of this collaborative interdisciplinary project.

1. The team needs to share a baseline epistemological framework

No collaboration can happen if there is no common framework between researchers specifying how data, models and tools are collected, manipulated and used. Although differences in the language used across different disciplines are commonly raised as a major challenge for interdisciplinary research, diverging views of what the scientific method entails and what the basic requirements of data collection, analysis and modelling are, pose a much more fundamental obstacle for a fruitful collaboration between disciplines. There are three major axes of scientific research where definitions, methods and interpretation need to be synchronised between partners prior to starting work: theory, data and models. Progress is unlikely to be achieved if partners disagree about such fundamental questions as to what constitutes evidence, the function of data and theory or whether the research questions (hypotheses) at the centre of the project need to be testable. This common challenge can be overcome with a solid amount of goodwill and openness between researchers involved in an interdisciplinary project, but it requires

time, effort and appreciation that different disciplines may have different takes on the fundamentals of how we do science.

2. An interdisciplinary researcher as a ‘bridge’ between disciplines is a worthwhile investment

One may expect that putting top experts in their disciplines together in one room is enough to spur research excellence. In practice this has proven numerous times to be an almost infallible recipe for disaster. Different disciplines operate in different semantic realms meaning that their representatives speak almost foreign languages and also work in different epistemological worlds where things get done differently. Similarly, it is easy to under- or over-estimate the level of knowledge and understanding of almost any topic by a partner from a different discipline since their educational trajectories differ significantly from ours. A common result of putting two experts together without someone acting as a ‘bridge’ or ‘glue’ between them are high levels of frustration, researchers accusing each other of incompetence and eventually, having everyone retreat back to the safety of their disciplinary boundaries. A team member who is neither the top specialist in discipline A nor in discipline B but who has experience of working in both can mean that the full potential of all team members is achieved. Where two people may be working at 20% of their capacity because they struggle to communicate, adding an interdisciplinary researcher is likely to decrease the risk of catastrophic failure due to miscommunication but also to ensure that the expertise of all team members is used to the full.

3. One of the legacies of an interdisciplinary project needs to be cross disciplinary training

When developing a new method, paradigm or research area within one discipline, this is often coupled with strong dissemination and training of other members of the community. The same should apply to any interdis-

ciplinary work. If method “a” from discipline A can be successfully applied to problem “b” in discipline B then part of the work should focus on laying out the groundwork for wider recognition of the new method among practitioners. This serves two purposes - first of all, it allows other researchers to critically engage with the study and its results; second, it enables them to pick up the knowledge and skills and ensures that what was originally ‘interdisciplinary’ work becomes part of the standard toolkit of the discipline.

4. The systemic barriers are standing strong despite the common calls from higher education management for more interdisciplinarity

High level of competitiveness and strict ‘selection’ criteria are the reality of academia across most of the world. Yet despite the common calls for ‘interdisciplinarity’ coming from all ranks of the Higher Education establishment, the footsoldiers of science (PhD students, postdocs and early career faculty) need to carefully navigate a system where transgression across disciplinary boundaries is commonly punished. What is the value for a physics PhD student of a paper published in an archaeological journal? Will a postdoctoral researcher be awarded a fellowship in computer science if their first degree was in history? Which department should an interdisciplinary researcher teach at if their expertise stretches across two distinct disciplines? Despite the seemingly unending ‘hype’ of interdisciplinarity, career paths and progression for interdisciplinary researchers are poorly defined, leaving them in a difficult situation in which only part of their academic output ‘counts’. Although having well-defined disciplinary boundaries is in many cases useful and necessary it is also important to counteract the disadvantage that they place on certain types of research. Without establishing a clear path for the professional development of interdisciplinary researchers this kind of work will be considered ‘risky’ in the long run even if short-term incentives (such as project funding) are presented. The work necessary to make systemic changes, such as the way in which tenure is granted, cannot be left entirely for early career researchers to shoulder.

Summary

The EPNet project proposed a research agenda focused on using formal modelling techniques to gain insight into the inner dynamics of trade in the Roman Empire. At the time, this was a revolutionary proposition and almost entirely terra incognita on the map of archaeological and historical research. Throughout the lifetime of the project, physicists, computer scientists, historians and archaeologists had to come together, iron out their differences and find a common way forward. It would be naive to suggest that this is an easy process but some of the challenges described above have also opened up new ways of looking at old problems. For example, one of the most common ‘sins’ of humanities research is the non-formal formulation of hypotheses (models) meaning that any attempts at operationalizing them in order to test them against existing data must necessarily include a solid amount of ‘interpretation’ of what the original author had in mind. This turned out to be an interesting exercise for all researchers involved and generated some great insights. Some of the issues (e.g. the systemic disadvantage of interdisciplinary research in academia) could not be solved within one specific project but they did help to identify where the disciplinary boundaries are most strictly enforced. However, the biggest impact of the EPNet project lies in demarcating the basic framework of this kind of interdisciplinary research and adopting tools and methods from other disciplines to the humanities context. This would not be possible without engaging with scholars across disciplinary boundaries.

References

- CEIPAC. (2019). “Centro para el estudio de la interdependencia provincial en la antigüedad clásica.” Retrieved from: <http://ceipac.ub.edu/> Accessed 20/05/2019
- Remesal, J., Díaz-Guilera, A., Rondelli, B., Rubio, X., Aguilera, A., Martín-Arroyo, D., Mosca, A., Rull, G. (2015). “The EPNet Project. Production and Distribution of Food during the Roman Empire: Economics and Political Dynamics.” In *Information Technologies for Epigraphy and Cultural Heritage. Proceedings of the First EAGLE International Conference*, pp. 455-464. Rome: Sapienza Università Editrice. Retrieved from: <http://ceipac.ub.edu/biblio/Data/A/0771.pdf>.
- romanopendata. (2019). “Roman Open Data. A Data Visualization & Exploratory interface.” Retrieved from: www.romanopendata.eu Accessed 20/05/2019

Case Study — The Interdisciplinary Laboratory on Climate Change at the University of the Balearic Islands: a Multidisciplinary Approach to Studying and Confronting Climate Change

Damià Gomis

Introduction

Climate change is one of the greatest challenges faced by society in the 21st century. The Interdisciplinary Laboratory on Climate Change at the University of the Balearic Islands (LINCC-UIB)⁽¹⁾ was founded in late 2017 with the objective of promoting the research, teaching, and transfer to society of the knowledge generated within the university community. Climate change is indeed a complex phenomenon that involves many different aspects and, as such, it must undoubtedly be confronted from a multidisciplinary approach. Consequently, the LINCC-UIB gathers staff from many different university departments (Applied Economics, Applied Pedagogy and Educational Psychology, Biology, Chemistry, Geography, Mathematics and Computer Science, Mechanical Engineering, Philosophy and Social Work, Public Law and Physics) and scientists from the Mediterranean Institute for Advanced Studies (IMEDEA)⁽²⁾ – (IMEDEA) - a joint centre between the University of the Balearic Islands and the Spanish Research Council - and from the Oceanographic Centre of the Balearic Islands (COB) belonging to the Spanish Institute of Oceanography (IEO). a joint centre between the University of the Balearic Islands and the Spanish Research Council) and from the Oceanographic Centre of the Balearic Islands (COB)⁽³⁾ belonging to the Spanish Institute of Oceanography (IEO). At present, more than 60 scientists from UIB, IMEDEA and COB-IEO belong to the LINCC-UIB, making it a multidisciplinary and inter-institutional laboratory.

1. <http://lincc.uib.eu/en/homepage/>, <https://www.uib.eu/>

2 <http://imedea.uib-csic.es/?lang=en>

3 <http://www.ba.ieo.es/>

LINCC-UIB mission

In our understanding, universities should not only play a leading role in the progress of scientific knowledge; they should also be a key actor among all the agents (public administrations, private sector and civil society) involved in the development of strategies for adapting to and mitigating the consequences of climate change. With this mission in mind, the major strategic lines of the LINCC-UIB are:

- To foster coordination between the members of the Laboratory belonging to different research groups. The transdisciplinary flow of information enriches every group's research. For instance, scientists working on the impact of environmental and social climate change can benefit from direct contact with climate modelers. Meanwhile, scientists and engineers working on adaptation and mitigation strategies benefit from direct contact with humanistic and social scientists: they are keener to adopt a holistic view of the problem and to avoid simplistic proposals based solely on technical advances. On a medium-term basis, such informal collaborations should lead to joint research projects funded by regional, national and international programs. The LINCC-UIB also aims to participate in national and international research networks, beyond the current, individual participation of many of its members.
- To extend the transdisciplinary collaboration to the educational field, promoting co-direction (involving different disciplines) of Degree Projects, Master's Projects and PhD Theses. On a longer-term basis, we aim to organize postgraduate and Master's courses dealing with the many different aspects of climate change.

- To transfer science-based knowledge from academia to stakeholders. To do so, we can perform advisory studies and reports on specific climate change issues. Beyond the unidirectional transfer of academic knowledge, the LINCC-UIB also encourages effective collaboration between all relevant climate change actors (public administration, the private sector and civil society) in order to build a consensus on the required adaptation and mitigation strategies. To do so, we rely on the organization of conferences, workshops and seminars aimed at analysing and exchanging experiences among the actors.
- To participate in public events and media in order to disseminate the many different aspects of climate change among the general public. This involves the organization of different activities such as talks and public debates.

Major activities carried out by the LINCC-UIB

In the one and a-half years from its foundation, the LINCC-UIB has already become a benchmark for climate change issues in the Balearic Islands. This has led to several specific achievements, some of which go well beyond the regional framework.

- One of the first achievements was the admission of the University of the Balearic Islands as an observer member of the United Nations Framework Convention on Climate Change (UNFCCC)⁽⁴⁾, which was formally ratified at the COP24 in Katowice (Poland) on December 2018. From Spain and in addition to the UIB, three other universities and four research centres are observer members of UNFCCC.
- At the European level, the LINCC-UIB is one of the three Associated Partners of the “Clean Energy for EU Islands Secretariat”⁽⁵⁾, funded by the European Commission. This program seeks to promote energy transition on European islands and archipelagos by providing technical, methodological and financial support for successful transition towards a clean and sustainable energy model.
- At a more regional level, the LINCC-UIB participated in the discussion of the Preliminary Draft of the “Climate Change and Energy Transition Law” promoted by the Government of the Balearic Islands. Researchers from the LINCC-UIB made several technical and conceptual recommendations on different aspects of the law before it was approved on February 2019 by the Parliament of the Balearic Islands⁽⁶⁾.
- Also at a regional level, the LINCC-UIB was requested by the Economic and Social Council of the Balearic Islands⁽⁷⁾, which involves representatives from many different sectors of society, to write a chapter on the economic, social and environmental perspectives of the Balearic Islands for 2030. Our report focused on the potential impacts of climate change on the environment, on the economy and on other societal aspects, in order to provide a tool for reflection to help to improve the policies of the different public administrations of the Balearic Islands.⁽⁸⁾
- Regarding the transfer of knowledge to society, the LINCC-UIB organized the “1st Conference on Climate Change in the Balearic Islands”, which brought together more than 150 academics, members of public administration, and economic and social agents to debate many different aspects of climate change. All of the presentations and a document presenting the conclusions are available at: <http://lincc.uib.eu/divulgacio/primeres-jornades-sobre-canvi-climatic-a-les-illes-balears/#> (in Catalan/Spanish).
- Finally, on the dissemination side, the LINCC-UIB holds a monthly series of talks aimed at taking the climate change research carried out at the UIB to society. All talks are recorded and can be viewed at: <http://lincc.uib.eu/divulgacio/cicle-de-conferencies-sobre-el-canvi-climatic/> (in Catalan/Spanish). The members of the LINCC-UIB are also actively present on the media (see a list of events with LINCC-UIB participation here: <http://lincc.uib.eu/divulgacio/activitats-de-divulgacio-cientifica-dels-nostres-membres/>, in Catalan/Spanish).

4. <https://unfccc.int/>

5. <https://euislands.eu/>

6. <http://www.caib.es/pidip2front/jsp/ca/fitxa-convocatoria/aprovada-la-llei-del-canvi-climagravic-i-transicioacute-energegravetica-de-les-illes-balears#>

7. http://www.caib.es/sites/ces/ca/home_del_ces-58/?campa=yes
8. The whole report (including chapter 5 on climate change) is available at: http://www.caib.es/sites/ces/ca/n/estudi_sobre_la_prospectiva_economica_socia_i_mediambiental_de_les_societats_de_les_illes_balears_a_lahoritz_a_2030_h2030/?mcont=51 (at present only in Catalan; it will be translated into other languages in the future).

This is all in addition to the ongoing scientific research carried out by the members of the LINCC-UIB. A non-exhaustive list of scientific publications on the different disciplines covered by the LINCC-UIB is available here: <http://lincc.uib.eu/en/research/publications/>.

Even so, the story has not been that easy...

All the aforementioned activities involve multidisciplinary knowledge and have implied collaboration between scientists from many different disciplines. However, the successful record presented here should not ignore the inherent difficulties of transdisciplinary cooperation. The first thing one notices when involved in an initiative such as the LINCC-UIB is that different disciplines often speak different languages: they use different methodologies, publish in different journals and have different ideas about the correct implication of scientists in societal affairs. The LINCC-UIB is no exception, and we have had to meet occasionally to discuss opposing views on the Laboratory's mission or to decide whether or not to take action regarding certain socio-political issues. On such occasions, we try to reach a consensus and, when this is not possible, we only take action when there is a vast supporting majority. What we all agree on is that transdisciplinary cooperation is not only convenient, but it is an essential requirement for achieving most of the objectives of the LINCC-UIB.

Case Study — ProjectTA-U: Where Artificial Intelligence (Science), Machine Translation (Technology) and Translation Studies (Humanities) Meet to Improve Higher Education Students' Access to Global Knowledge

Anna Aguilar-Amat, Pilar Cid-Leal, Marta Fuentes, Olga Torres-Hostench

Introduction

Artificial intelligence techniques and big data are increasingly being used in machine translation. Nevertheless, critical human thinking is still needed to fix machine translation mistakes. In the ProjectTA-U project (Ref. Ref.FFI2016-78612-R) we approach our research from different perspectives (scientific, technological and humanistic) to improve communication in a multilingual and multicultural Higher Education (HE). Some of the research questions of the project are: which language(s) do HE students learn in? How do HE students access academic knowledge? Do they use machine translation as a tool to help with comprehension? To avoid ethnocentric views, would it be possible to use machine translation to encourage the provision of access to academic knowledge in languages other than English? Considering that machine translation has not yet reached the desired efficiency, how could human professional translation skills be transferred to digital users (students and staff) in higher education in a fast and easy way in order to properly fix machine translation errors? How can domain-specific machine translation systems be created and trained?

Objectives

The ProjectTA-U project applied to Higher Education has three aims:

1. To conduct a far-reaching survey on the use of foreign languages and machine translation by students to measure the extent to which they access global university knowledge;
2. To develop training materials to empower university students and staff to be able to fix machine translation mistakes, apply strategies from professional humanistic translation studies and develop critical thinking, and;
3. To present the MTradumàtica web platform developed in the project to potential users and encourage them to use the user-friendly interface to train and customize domain-specific machine translation systems.

Development

An exhaustive questionnaire of 40 items on the use of foreign language and machine translation by HE students was designed, validated and piloted at the Universitat Autònoma de Barcelona (UAB). Preliminary results of the pilot survey conducted on seventy students from the Degree in Primary Education at UAB show that despite 55% of students having a good knowledge of English, only 20% occasionally use and read sources in a foreign language, and that foreign language is always English. Up to 41% sometimes use machine translation at present and up to 61% have used it in the past for academic homework. More specifically, machine translation is more used as a dictionary (54%) and to understand texts (71%) than to write in a foreign language (36%). Despite the widespread use of machine translation, 52% of students do not rely on its output. In the future, the survey will be extended to include other faculties and universities. The results will be accompanied by diagnosis and proposed measures and training materials to improve access to global knowledge and

encourage users to apply critical thinking to machine translation output.

For advanced machine translation users and/or, for instance, research centres interested in machine translating their own domain-specific materials, we developed MTradumàtica, a free, Moses-based web platform for training and using machine translation systems with a user-friendly graphical interface. Its goal is to offer users a free open tool to customise their own machine translation with domain-specific engines. Contrary to generic machine translation systems, which do not allow for customization of content and whose output may not be focused on a specific domain, “these engines are built from domain-specific parallel corpora. This means that users can use their own resources or open resources (such as corpora from the Opus collection: <http://opus.lingfil.uu.se>) and customise their own engines according to their needs.”⁽¹⁾

MTradumàtica is currently available for testing, and can be installed either on a server accessible from any computer or standalone on a PC. “A compressed package is provided (less than 3 MB) with installation instructions, which will allow any user to install their own version of MTradumàtica.”⁽²⁾

Users can create a domain-specific engine by uploading sentence-aligned parallel files in two languages on a specific domain in the usual Moses text format or TMX format. Then, the system uses these files to train a translation model and a language model. A translation model is built by automatically comparing both languages and establishing direct statistical relationships between their elements. A language model is built from monolingual texts to provide more natural and correct output in the target language. Finally, the engine is trained with the provided corpora and is then ready to be used.

Figure 1. Screenshot of MTradumàtica, a domain-specific machine translation system trainer.

The screenshot shows the MTradumàtica web interface. At the top, there is a dark navigation bar with the following items: 'MTradumàtica', 'Data', 'Train', 'Translate', 'Evaluate', 'Login', and 'EN'. Below the navigation bar, the main content area has a large heading 'MTradumàtica' with a 'Download' button. Underneath, there are two columns of text. The left column describes training SMT systems and includes a button 'Start uploading your files now'. The right column describes evaluating MT systems and includes a button 'Evaluate your systems now'. The bottom section contains six cards for different tasks: 'Upload files', 'Create Monotexts', 'Build LMs', 'Create Bitexts', 'Build Translators', and 'Translate', each with a brief description and a corresponding action button.

1. Dođru, Gokhan, Sergio Ortiz-Rojas, and Adria Martin-Mor. (2017). “MTradumàtica: Free Statistical Machine Translation Customisation for Translators.” [Poster]. Annual Conference of the European Association for Machine Translation (EAMT). https://ddd.uab.cat/pub/posters/2017/174910/MTradumàtica_EAMT_May_2017.pdf

2. Martin-Mor, Adria. (2017). “MTradumàtica: Statistical machine translation customisation for translators.” Skase journal of translation and interpretation, v. 10, n.1 pp. 25-40. http://www.skase.sk/Volumes/JTI12/pdf_doc/02.pdf

Key facts that show that there is room for improvement

Even though HE students are supposed to have a good knowledge of English, they prefer to read academic sources in their mother tongue. Students need to be motivated to access knowledge worldwide, not only in English, but also in other foreign languages. Machine translation may help to introduce multilingual and multicultural academic knowledge to our campuses.

Although our preliminary results show that students mainly use machine translation as a dictionary, there is a legitimate concern among HE institutions of the risk of plagiarism from the use of machine translation, i. e., students copying academic sources translated with a machine translation system, which would be more difficult for an anti-plagiarism system to detect. Awareness and training programs are needed to balance the pros and cons of these systems in class.

HE users could be trained in using and training customized machine translation systems as well as in the use of corpora. The analysis of corpus may help to obtain information about concepts and the underlying sub-concepts. Moreover, the importance of a term in a corpus can help to decide on the pertinence of the proposed translation. Users in HE generally use generic machine translation systems without domain-specific features, and they normally use them as a dictionary. Domain-specific corpora can be used to develop customized machine translation systems such as MTradumatica.

Artificial intelligence techniques and big data are increasingly being used in machine translation. Critical human thinking, however, is still needed to fix machine translation mistakes. Users should not rely blindly on machine translation output and should adopt an active role in detecting mistakes and fixing them if they learn how.

Conclusions

There is a need to empower higher education students to engage in autonomous learning by accessing knowledge from all over the world using machine translation combined with critical thinking. The wise use of machine translation could be integrated into HE competences.

Acknowledgements

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www.Tradumatica.net

Tradumàtica magazine

<https://revistes.uab.cat/tradumatica>

7. Who knows? Knowledge implies a certain conception of who the subject of this knowledge is. Who is our current knowledge system aimed at today? Who are the beneficiaries and who are not? How do we define the concept of profit? Is it possible to hold a universal point of view?

Unravelling Silicon Valley's Innovation System from a Southern Perspective

Raúl Delgado

Abstract

The paper explores the profound restructuring of the system of scientific and technological innovation over the last two-and-a-half decades, where the concentration and private appropriation of the means of knowledge creation and scientific and technological innovation has reached major proportions. This trend has engendered a regressive path in the advancement of knowledge, exacerbating the propensity of the world system towards crisis, putting the very material bedrock of life, work and nature at risk.

The aim of this chapter is to analyse some of the fundamental features of this restructuring and capitalist development process and unravel what can be regarded as the cutting-edge capitalist innovation system with its epicentre in Silicon Valley and with increasingly important corporate subsidiaries in peripheral countries. The analysis is based on what the authors conceive to be a Southern perspective. Rather than a simple negation of the dominant, northern perspective, it implies a negation of the negation in dialectical terms, with the aim of building a comprehensive, inclusive, emancipatory and libertarian approach to the development of society's productive forces. From this alternative standpoint, Silicon Valley's innovation system is portrayed as a patenting machine, aimed at accelerating and appropriating the products of the general intellect with the overarching aim of concentrating and centralising human capital in the form of brain power, knowledge and skills.

Introduction

We are witnessing today a new phase in the national and global development of productive forces, whereby intellectual property and the ownership of patents have become key components of the imperial(ist) system of domination under the aegis of neoliberal capitalism (Rodríguez 2008). This phenomenon is taking place within the institutional and policy framework of a system set up in the 1980s to liberate the “forces of economic freedom”

(capital, the market, private enterprise, globalisation) from the regulatory constraints of the welfare-developmental state. At issue is a system of “global governance” in which the concentration and centralisation of capital has reached unprecedented levels. The diverse and multifaceted dynamics of this process have been extensively studied and analysed in different regional and national contexts. However, a relatively understudied aspect of this process is the profound restructuring of the system of scientific and technological innovation at the heart of the capitalist development process over the last two-and-a-half decades, where the concentration and private appropriation of the means of knowledge creation and scientific and technological innovation – what Marx defined as the general intellect – has reached major proportions. This trend, far from favouring a progressive development of society's productive forces – a historic mission that Marx ascribed to capitalism – has engendered a regressive path in the advancement of knowledge, exacerbating the propensity of the world system towards crisis, putting the very material bedrock of life, work and nature at risk – a problem that has acquired global and indeed planetary proportions. However, the inherent contradictions of capitalist modernity that have engendered an unbearable relationship between progress and barbarism – as two heads of the same coin – have different and contrasting implications along the North-South divide (Echeverría 2011; Arizmendi and Benstein 2018).

The aim of this chapter is to unravel some of the fundamental features of this restructuring and capitalist development process in what David Harvey (2005) has described as the neoliberal era and Samir Amin (2013), from a world systems and monopoly capital perspective, has termed the era of generalised monopolies. With reference to the systemic dynamics and forces at work in these conditions, the chapter seeks to unravel what can be regarded as the cutting-edge capitalist innovation system with its epicentre in Silicon Valley and with increasingly important corporate subsidiaries in peripheral countries. Our analysis is based on what we conceive to be a *Southern perspective*. Rather than a simple negation of the dominant, northern perspective, it implies a

negation of the negation in dialectical terms, with the aim of building a comprehensive, inclusive, emancipatory and libertarian approach to the development of society's productive forces. From this alternative standpoint, Silicon Valley's innovation system is portrayed as a *patenting machine*, aimed at accelerating and appropriating the products of the general intellect with the overarching aim of concentrating and centralising human capital in the form of brain power, knowledge and skills. Under such circumstances, the inherent contradictions of capitalist modernity can no longer be veiled by a discourse on the construction of a knowledge economy based on incessant technological progress and concentrated brainpower in the form of Research and Development:

Today's humanity has ... inherited unprecedented capacities and possibilities, of knowledge, technology [and] communicability [but paradoxically] ... is facing its share of the perennial problems of humankind, of finding its livelihood, staking out a path to a good life, resolving conflicts and issues of injustice, coping with the dialectics and the unintended consequences of evolution, the dialectics highlighted by, e.g. the rise of mortality among the marginalized in the midst of the biomedical revolution. On top of that humanity has to confront the unprecedented challenge of climate change and of creating sustainability amidst an inhabitable planetary environment (Van der Linden et.al. 2018: 14).

From a Southern perspective, Silicon Valley's Innovation System not only epitomizes the overarching contradictions of capitalist modernity but also given the growing dependence on highly skilled labour from peripheral countries the possibility of advancing towards what Bolivar Echeverría (2011) conceptualised as *alternative modernity*, i.e. a radically different process of developing productive forces in response to social needs and in harmony with nature.

The Emergence of Silicon Valley's Imperial Innovation System

A critical dimension and complex issue of capitalist development in the contemporary era relates to how large multinational corporations in the communications and information technology sector, many of them headquartered or with venture capital posts in Silicon Valley, have managed to place at their disposal the "human capital"

and knowledge production capacity formed in both the centre and the periphery of the world system. This development – the accumulation of knowledge and skills as a productive resource and a crucial force of production – has undergone a similar process and is subjected to the same conditions as capital in other sectors. This includes the concentration and centralisation of capital, a process that aims to reduce labour costs, transferring associated risks to non-capitalist producers, and capitalising on the benefits appropriated through the ownership of patents to the knowledge or social technology embodied in the production process (Delgado Wise 2015; Delgado Wise and Chávez 2016; Míguez 2013).

Over time, this capitalist development process has led to the construction of an "innovation system" within a knowledge-based global economy – what could be viewed as an imperial innovation system that has six characteristic features:

1. The increasing internationalisation of research and development (R&D) activities by means of the organisation and promotion of *collective forms of innovation* such as peer-to-peer, share economy, commons economy and crowd-sourcing economy through what can be viewed as *open innovation*. In contrast to the traditional innovation processes that normally take place "behind closed doors" in the R&D departments of large multinational corporations, this trend includes the opening up and spatial redistribution of knowledge-intensive activities through the participation of external partners in such activities as start-ups that operate as privileged cells of the new innovation architecture and the supply of risk capital, headhunters, law firms, subcontractors, universities, research institutions and so on to create complex "ecosystems" of innovation (Chesbrough 2008). This new way of organising general intellect has given rise to a permanent configuration and reconfiguration of innovation networks that interact within an institutional framework commanded by the large multinational corporations and the Imperial State (see Figure 1) and that, in the particular case of Silicon Valley, transcends hitherto unavailable forms of technological transformation of increasing complexity and dynamism at a furious pace.
2. The *creation of scientific cities*, such as Silicon Valley in the United States and the new "Silicon Valleys" established in recent years in peripheral areas or emerging regions, principally in Asia, where collective synergies are created to accelerate innovation processes (Bruche

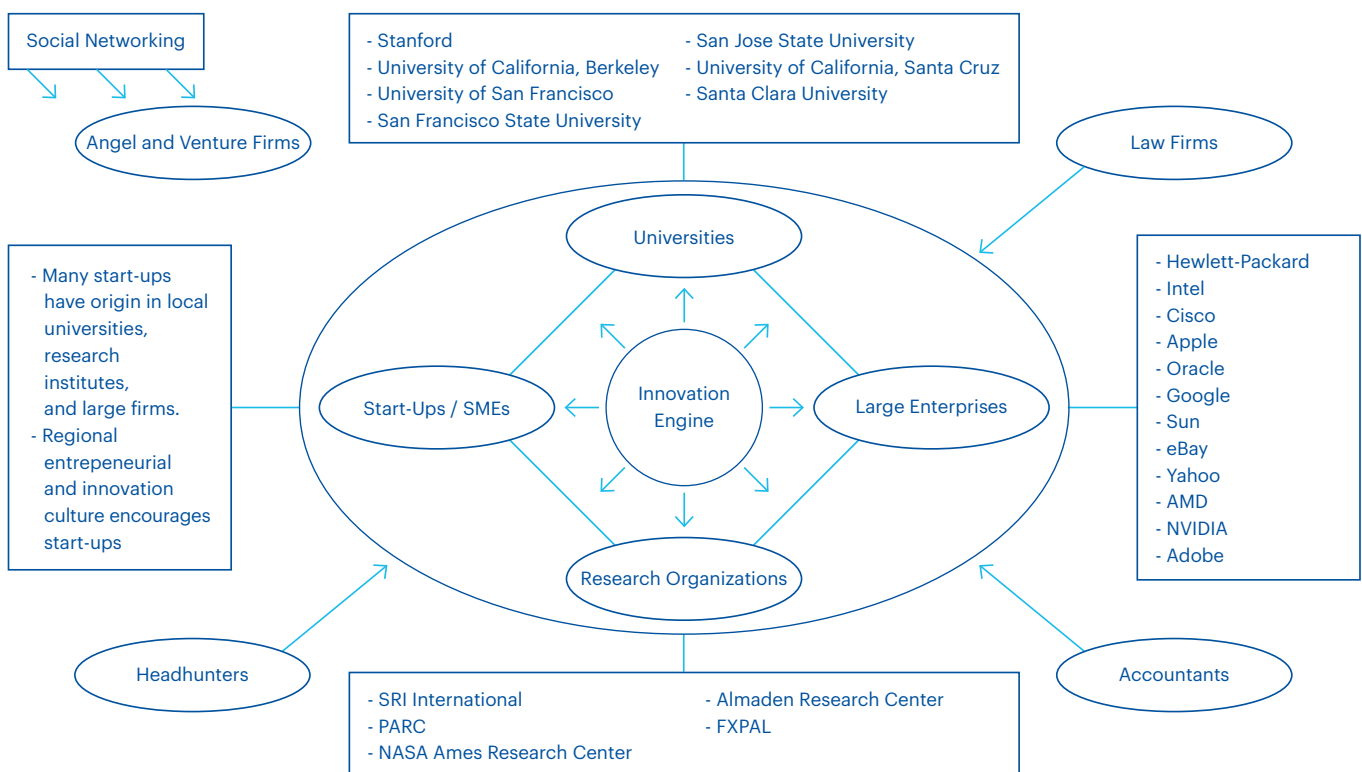
2009; Sturgeon 2003). As conceptualised by Annalee Saxenian (2006), this development embodies a new georeferenced paradigm of innovation based on flexibility, decentralisation and the incorporation of new stakeholders that simultaneously interact in local and transnational spaces. Silicon Valley lies at the core of a new global innovation system that is surrounded by a constellation of scientific maquiladoras that are allocated to peripheral spaces.

3. The development of new methods for controlling R&D agendas (through venture capital, partnerships and subcontracting, among others) and appropriating the products of scientific endeavours through the acquisition of patents by large multinational corporations. This critical function is undertaken by law firms that operate as key players in Silicon Valley's innovation ecosystem through: a) the establishment of contracts and agreements with start-ups, acting as or being assisted by corporate headhunters; b) the negotiation of agreements and partnerships with angel and venture firms; and, most importantly c) the application and registration of patents through the platform established by the Patent Cooperation Treaty (PCT) and institutionalised by the World Intellectual Property Organization (WIPO) (see Figure 2). These new and complex forms of control

and management of the general intellect are described as strategic investment (Galama and Josek, 2008).

4. A rapidly expanding and highly skilled workforce – particularly, in the areas of Science, Technology, Engineering and Mathematics (STEM) in the Global South is being tapped by multinationals for R&D in countries both at the centre and on the periphery of the system through recruitment via partnerships, outsourcing and offshoring. This spatial restructuring of R&D has crystallised into a new geography of innovation, in which R&D – following the pattern of industrial production – is shifting towards peripheral economies. In fact, this trend can be viewed as a higher stage in the development of global networks of monopoly capital as the new international division of labour moves up the value-added chain to R&D (Delgado Wise 2017a), and monopoly capital moves to capture the productivity gains and knowledge of a highly skilled workforce in the Global South (Arocena and Sutz 2005). This trend can be traced in different sectors of the global economy, including agricultural biotechnology and bio-hegemony in transgenic crops, and the appropriation of indigenous knowledge regarding seed technology (Gutiérrez Escobar and Fitting 2016; Lapegna and Otero 2016; Motta 2016; see Table 1).

Figure 1. The Silicon Valley Ecosystem

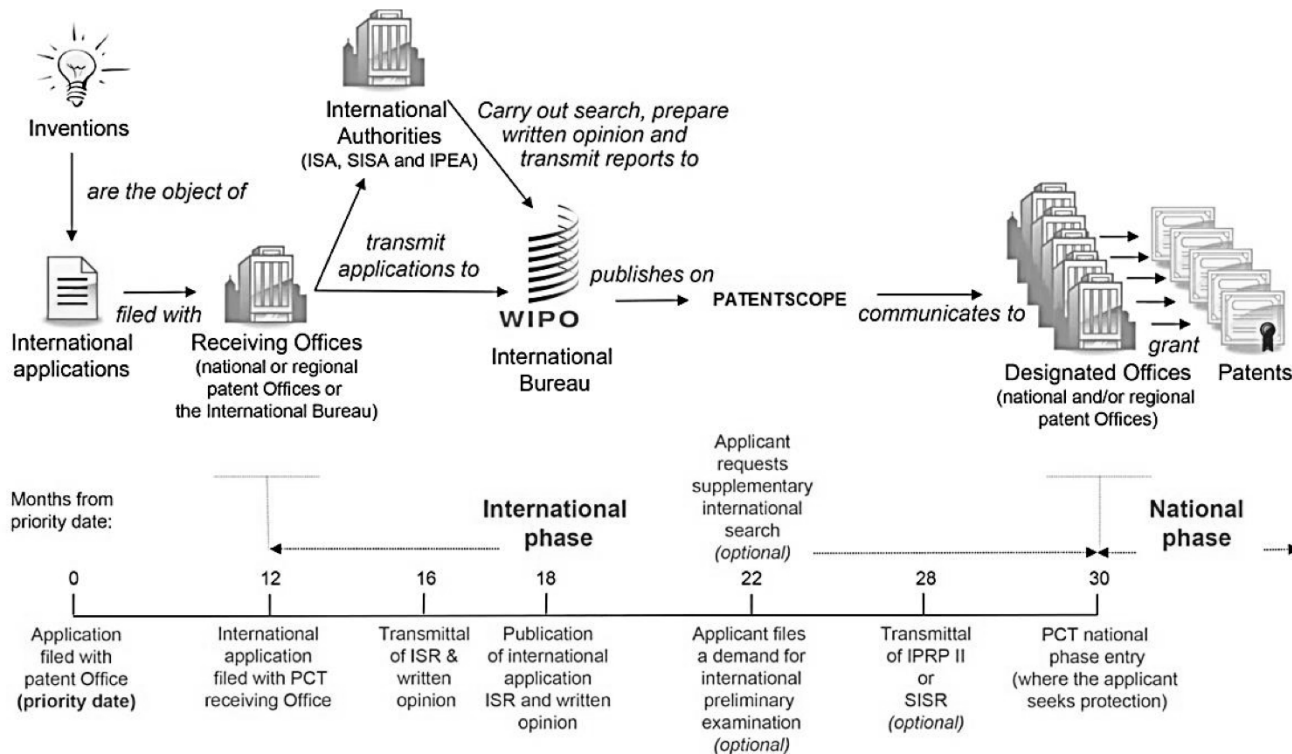


Source: Strategic Business Insights (2017).

- All of this has led to the unprecedented appropriation of knowledge as intangible common goods, giving rise to an abundant expansion, concentration and private appropriation of the products of general intellect, which – far from promoting a progressive path to development in productive forces – has spawned a regressive phase in the advancement and application of knowl-

edge. Moreover, patents are sometimes acquired by monopoly capital to prevent or postpone their application with the aim of controlling and regulating markets, giving rise to what Guillermo Foladori (2014) describes as “fictitious science” given its speculative character – echoing the notion of fictitious capital coined by Marx.

Figure 2. Overview of the PCT System



Source: WIPO <https://www.wipo.int/pct/en/faqs/faqs.html>.

Table 1. North–South Balance in Patent Applications, 1990–2010

Direction of flows	Period 1990-2010	Year			Growth rate	Per cent distribution	
		1990	2010	1990-2010		1990	2010
Total	820,072	2,922	91,720	18.8	100.0	100.0	100.0
South–North non-OECD to oecd Countries ^a	317,946	654	39,936	22.8	38.8	22.4	43.5
North–South oecd to non- oecd countries	23,598	54	3,822	23.7	2.9	1.8	4.2
North–North oecd to oecd countries	464,900	2,208	45,880	16.4	56.7	75.6	50.0
South–South oecd to non-oecd countries	13,628	6	2,082	34.0	1.7	0.2	2.3

^aSource: Our own calculations, with data from the World Intellectual Property Organization (WIPO 2017) and Miguelez and Fink (2012).
^aThe Organisation for Economic Co-operation and Development (OECD) in this context does not include Mexico, Chile or Turkey.

6. And, most importantly, the creation of an ad hoc *institutional framework aimed at the concentration and appropriation of products created by the general intellect through patents*, embodied in the World Intellectual Property Organization (WIPO) and the World Trade Organization (WTO; Delgado Wise and Chávez 2016). Since the late 1980s, a trend towards ad hoc legislation has been initiated in the United States, in line with the strategic interests of large multinational corporations regarding intellectual property rights (Messitte 2012). Through regulations promoted by the WTO, this legislation has broadly expanded. Negotiations for the signing and implementation of the Free Trade Agreements (FTA) have been carried out through the Office of the US Trade Representative, which in turn has protected and represented the interests of industries that are intensive in their use of intellectual property. Because of their multilateral nature, intellectual property disputes within the WTO tend to become more complex, so the US strategy also includes bilateral FTA negotiations as a far-reaching means to control markets and

increase corporate profits. The regulations established by the Patent Cooperation Treaty—modified in 1984 and 2001—in the framework of WIPO–WTO have contributed significantly to this trend.

It is worth adding that in line with the nature of the imperial innovation system described above, the United States features as the world's leading innovation capitalist power, accounting for 28% of all patent applications through the WIPO system from 1996 to 2010. The total figure for the Organisation for Economic Cooperation and Development (OECD) countries (excluding Mexico, Chile and Turkey) accounts for 90% of global patent applications (Table 2).

Towards a Southern Perspective of the construction of a knowledge economy

Silicon Valley's Imperial Innovation System embraces a critical paradox: while its dynamism increasingly relies on highly skilled labour from peripheral countries, it hinders the development potential of those countries. This entails the implementation of new and severe forms of unequal exchange through the transfer of highly skilled labour together with its R&D and innovation capacity (Delgado Wise 2017b). In other words, Silicon Valley represents a patenting machine based on a growing R&D capacity from the South at the service of the North and against the South. Under these circumstances, how can a Southern perspective of the realm of innovation be envisioned? Can any experiences be viewed as steps forward in this direction?

In the academic and political discussion on highly skilled migration, the concept of "brain drain" has been replaced by the notion of "brain or talent circulation" (Meyer 2011; Saxenian 2006). From this perspective, the pessimism and concern about highly skilled South-North migration has transformed into a rampant optimism that substitutes the notion of loss with that of gain. This view is based upon the supposition that knowledge is, in itself, beneficial for all and that contact with highly skilled compatriots abroad generates synergies that drive development in the country of origin, regard-less of where, how, in what situation and for whom they work. Knowledge, as much as research agendas, is viewed as

Table 2. Patent Applications PCT–WIPO

Country	Patent applications
Total worldwide	4,482,343
Total OECD	4,032,186
Top 10 countries	3,673,953
United States	1,237,060
Japan	710,516
Germany	627,460
United Kingdom	216,480
France	212,571
China	208,665
Korea	183,584
Canada	102,917
Netherlands	93,105
Sweden	81,595

Source: Our own calculations based on data from Miguelez and Fink (2012).

neutral and, in a similar vein, the question of intellectual property that is, the appropriation of the products of scientific and technological work is undervalued or simply ignored. Further, the unbridled euphoria around the “circulation of talent” and the creation of outreach programmes with the “highly skilled diaspora” arise from the assumption that innovation creates, through incubation processes, its own ties with the productive, commercial, financial and service sectors in countries of origin.

None of the assumptions upon which the optimism of the supporters and followers of the ‘brain or talent circulation’ concept are grounded fits with the reality of contemporary capitalism, and more specifically with what we have described as Silicon Valley’s Imperial Innovation System. This does not mean, however, that the notion of “talent circulation” should be totally discarded. On the contrary, explicit identification of its assumptions and the mechanism by which it could be attained, particularly for the benefit of the country of origin’s development (i.e. from a Southern perspective), constitutes a useful reference point for the design of coherent public policies for properly contextualized innovation systems that are tied to the country of origin, with direct pathways towards the productive, commercial and service sectors.

None of the assumptions upon which the optimism of the supporters and followers of the ‘brain or talent circulation’ concept are grounded fits with the reality of contemporary capitalism

A first and fundamental issue in the makings of a Southern perspective is to envision an alternative development model. In this regard, it is crucial to acknowledge that Latin American contributions to development theory have left an indelible mark on the field of development studies, giving it a more critical edge. These contributions relate not just to the vibrant debates on the development question, but to the activism of social movements and a history of experimentation with diverse forms and models of development (Delgado Wise and Veltmeyer 2018).

In the last three decades a new wave of critical Latin American thought on development – including alternatives to development – has emerged, ranging from neo-structuralism and neo-developmentalism to neo-dependency, 21st century socialism, Buen Vivir (Sumak Kawsay in Quechua), and radical forms of resistance (Zapatismo) from below (within communities and social movements) aimed at building ‘a new world encompassing many worlds’.

The main features of the development project envisioned in this new wave of critical thought are not simply an abstract model of socialism or post-capitalism. The sources of inspiration for the social transformation project were diverse and based on a wide range of experiences derived from the practice – and theory of social movements in the region. Included here is a recovery of indigenous values such as social solidarity and harmony with nature, the envisioning of new communal production and consumption systems, the recovery and preservation of the commons, and the construction of a non-homogeneous and non-hegemonizing new world (Delgado Wise and Veltmeyer 2018).

The role of higher education and research institutions is crucial for advancing this perspective. By recovering their role as a part of the global commons a public good, a universal human right and part of our heritage these institutions can function as: a) generators of productive and emancipatory knowledge; b) mentors of a critically, socially and environmentally committed citizenship; and c) autonomous agents for development and social transformation. This implies the need to shift towards a new educational and R&D model based on:

- Critical thinking as a method of learning, knowledge construction and emancipatory sensitivity;
- Trans and interdisciplinarity as a mechanism to apprehend reality in its full complexity and diversity;
- A fruitful dialogue of knowledge that transcends the dominant paradigm of science and claims knowledge that has been historically denied by the West within the framework of a Southern epistemology (Santos 2009);
- Curricular flexibility in educational programs, school trajectories, areas of knowledge and research projects, as well as innovation and technological development; and
- Mobility of researchers, lecturers and internal and inter-institutional students, nationally and internationally, in a framework of fair and solidary internationalization.

A central element for advancing towards a Southern perspective is to articulate a view from outside the centres of scientific and philosophical production, a decolonialised perspective capable of incorporating new categories and concepts that de-totalize the intended universality of the Western world in the face of the valuable, varied and extensive social experience with a multitude of Southern micro-rationalities that make up totalities in many parts, and not as compo-

nents of a totality and a global rationality.

A central element for advancing towards a Southern perspective is to articulate a view from outside the centres of scientific and philosophical production, a decolonialised perspective capable of incorporating new categories and concepts that de-totalize the intended universality of the Western world

Some of Boaventura de Sousa Santos' main lines of thought come from the project *The reinvention of social emancipation*, where theory and praxis are articulated outside the hegemonic centres of social science creation, with a strong interaction of cultures and knowledge, and in places where there is an alternative movementist praxis (that is, in countries of the periphery and semi-periphery). These spaces, irrelevant to the Western world and its biased means of communication, are key to the research on emancipation that Santos proposes (Monedero 2004).

Another fundamental aspect for advancing towards a Southern perspective is to design and implement national laws that are capable of counterbalancing the "straightjacket" imposed by the institutional framework (PCT-WIPO) designed by the United States and other Imperial powers to ensure control and appropriation of scientific knowledge, the product of the general intellect, by large multinational corporations. An important example in this regard is the "Organic Code of the Social Economy of Knowledge, Creativity and Innovation" decreed on December 1, 2016 by the National Assembly of the Ecuadorian Republic, which in its third article, fraction 1, clearly exposes its main purpose:

Generate tools to promote an economic model that democratizes production, transmission and appropriation of knowledge as a good of public interest, and thus guaranteeing the accumulation and redistribution of wealth in a fair, sustainable manner in harmony with nature.

Conclusions

The restructuring of innovation systems provides a privileged vantage point for analysing and understanding the meaning and implications of the forms of knowledge appropriation that distinguish neoliberal globalization, and that underlie the logic of domination that accompanies free trade agreements promoted by the large multinational corporations and the main impe-

rialist powers led by the United States. These are not win-win agreements for all participants, but strategies that intensify the dynamics of uneven development within contemporary capitalism. They also lead to a rampant race towards the expansion and appropriation of the products of scientific and technological work in order to obtain huge monopolistic profits at any cost. In many ways, this shows that we are facing a potentially terminal crisis of capitalist modernity that underscores the schizoid clash between progress and devastation:

If on the one hand there is the revolution of techno-sciences (nanotechnology, biotechnologies, information technologies), on the other, there are its unequivocal signs of barbarism: "misery societies" proliferating rhizomatically; overexploitation of the worker due, among other things, to a global attack against international wages; exponential growth of the reserve army that results in the growth of poverty; increase in forced internal and international migration (Delgado Wise, 2013) and swelling of the ranks of organized crime (Martínez Olivares 2018).

In contrast and opposition to this modernity, it is possible to envision and move towards an alternative modernity, that is, a non-capitalist modernity that "... implies a true abundance and a true emancipation ... a modernity that never was, never existed, not—as Habermas says—to complete the project of modernity, but to invent a different one that was possible even before and that was repressed and denied, and until now postponed." (Echeverría 2011: 290). This implies the need to move in the direction of a radical social transformation process centred on social needs and in harmony with nature, which implies, inter alia, the defence at all costs of tangible and intangible common goods (Laval and Dardot 2015).

References

- Amin, S. (2013). *The Implosion of Capitalism*. London: Pluto Press.
- Arizmendi, L. & Benstein, J. (2018). *Tiempos de Peligro: Estado de Excepción y Guerra Mundial*. México: Plaza y Valdés-UAZ.
- Arocena, R. & Sutz, J. (2005). Innovation Systems and Developing Countries. *DRUID Working Paper, 02–05*. Aalborg: Danish Research Unit for Industrial Dynamics.
- Bruche, G. (2009). The Emergence of China and India as New Competitors in MNCs. *Innovation Networks. Competition and Change* 13 (3), pp. 199–213.

- Chesbrough, H. (2008). Open Innovation: A New Paradigm for Understanding Industrial Innovation. In *Open Innovation: Researching a New Paradigm*, edited by H. Chesbrough, W. Vanhaverbeke, and J. West, Oxford: Oxford University Press, pp. 1–14.
- Delgado Wise, R. (2017a). El capital en la era de los monopolios generalizados: sobre el capital monopolista, *Observatorio del Desarrollo* 6(18), pp. 48 - 58.
- Delgado Wise, R. (2017b). Claves para descifrar el sistema imperial de innovación comandado por Estados Unidos, *Estudios Críticos del Desarrollo* VII (12), pp. 123 - 152.
- Delgado Wise, R. (2015). Unraveling Mexican Highly-Skilled Migration in the Context of Neoliberal Globalization. In *Social Transformation and Migration: National and Local Experiences in South Korea, Turkey, México and Australia*, edited by S. Castles, M. Arias Cubas, and D. Ozkul, Basingstoke: Palgrave MacMillan, pp. 201–218.
- Delgado Wise, R. & Chávez, M. (2016). Patentad: Apuntes Sobre la Apropiación. *Observatorio del Desarrollo* 4 (15), pp. 22–30.
- Foladori, G. (2014). Ciencia Ficticia. *Estudios Críticos del Desarrollo* IV (7), pp.4 1–66.
- Echeverría, B. (2011). *Antología. Crítica de la modernidad capitalista*. La Paz: Oxfam, Vicepresidencia del Estado Plurinacional de Bolivia.
- Galama, T. & Hosek, J. (2008). *US Competitiveness in Science and Technology*. Santa Mónica: RAND Corporation.
- Gutiérrez Escobar, L. & Fitting, E. (2016). Red de Semillas Libres: Crítica a la Biohegemonía en Colombia. *Estudios Críticos del Desarrollo* VI (11), pp. 85–106.
- Harvey, D. (2005). *A Brief History of Neoliberalism*. Oxford: Oxford University Press.
- Lapegna, P., and Otero, G. (2016). Cultivos Transgénicos en América Latina: Expropiación, Valor Negativo y Estado. *Estudios Críticos del Desarrollo* VI (11), pp.19–44.
- Laval, C. & Dardot, P. (2015). *Común: ensayo sobre la revolución en el siglo XXI*. Barcelona: Gedisa.
- Martínez Olivares, A. (2018). Contribuciones a la crítica de la modernidad capitalista desde la Perspectiva del Sur, *working paper*, Mestría en Filosofía, Universidad Autónoma de Zacatecas.
- Messitte, P. (2012). Desarrollo del Derecho de Patentes Estadounidense en el Siglo XXI. Implicaciones para la Industria Farmacéutica. In Oropeza A. & Guízar López, V. M. (eds) *Los Retos de la Industria Farmacéutica en el Siglo XXI. Una Visión Comparada Sobre su Régimen de Propiedad Intelectual*, Mexico: UNAM–Cofep, pp. 179–200.
- Meyer, J.B. (2011). La sociología de las diásporas del conocimiento In Luchilo, L. (ed.) *Más Allá de la Fuga de Cerebros: Movilidad, Migración y Diásporas de Argentinos Calificados*. Buenos Aires: Universidad de Buenos Aires, pp. 91–114.
- Migueluez, E., & Fink, C. (2012). Measuring the International Mobility of Inventors: A New Database. *WIPO Economic Research Working Paper*, no. 8e, WIPO. http://www.wipo.int/pct/en/pct_contracting_states.html.
- Monedero, J.C. (2004). Estudio introductorio. Conciencia de frontera: la teoría crítica posmoderna de Boaventura de Sousa Santos In <http://www.boaventuradesousasantos.pt/documentos/Introduccionversionfinal-Juan%20Carlos%20Monedero.pdf>.
- Motta, R. (2016). Capitalismo global y Estado Nacional en las Luchas de los Cultivos Transgénicos en Brasil. *Estudios Críticos del Desarrollo* VI (11), pp. 65–84.
- Rodríguez, F. (2008). El Sistema de Patentes y el Desarrollo Tecnológico: Algunas Consideraciones en el Marco de la libre Competencia. *Propiedad Intelectual* 7 (11), pp. 87–109.
- Santos, B. de S. (2009). *Epistemología del Sur*. Mexico: CLACSO-Siglo XXI.
- Saxenian, A. L. (2006). *The New Argonauts: Regional Advantage in a Global Economy*. Boston, MA: Harvard University Press.
- Strategic Business Insights (2017). Innovation Ecosystem. <http://siliconvikings.com/blog/2017/12/21/silicon-valley-challenges-ahead>.
- Sturgeon, T. (2003). What Really Goes on in Silicon Valley? Spatial Clustering and Dispersal in Modular Production Networks. *Journal of Economic Geography* 3 (2), pp. 199–225.
- Van der Linden, M. et al. (2018). Ch. 1: Social Trends and New Geographies. In *Rethinking Society for the 21st Century. Report of the International Panel on Social Progress*. Volume 1: Socio-Economic Transformations, Cambridge, UK: Cambridge University Press, pp. 9–40.
- World Intellectual Property Organization (2017). WIPO Intellectual Property Laws and Treaties Database (WIPO Lex). Accessed November 15, 2017. www.wipo.int/wipolex/en.

From Info-Cognitive Extractivism to the Social Economy of Knowledge: A Proposal from the Global South

Analía Minteguiaga and René Ramírez

Abstract

As in mercantilism, in which profits by transfer were made through violent processes that exploited slave labor and natural resources, we have returned to the same rentier profiteering in the form of info-cognitive extractivism. Data mining extracts information from material and immaterial life, processes it and sells it through different forms of intellectual property. This new form of extractivism is causing the neo-dependency of countries in the global south, or periphery, on those that own the intellectual property despite the fact that a large number of primary and tertiary resources come from the global south. To tackle these processes of cognitive injustice and global asymmetry, people in South America have proposed the “social economy of knowledge, creativity and innovation”. The article presents the principles and guidelines proposed from the global south for the construction of another form of government of knowledge where its public and common sense is recovered and its utilitarian and mercantile perspective is abandoned.

Introduction

Capitalism bases its health on profitability. Historically, profit has been produced through the transfer of wealth (mercantile stage) or through the generation of surplus value from labor (industrial capitalist stage).

Today, we are witnessing how the primitive or original methods for accumulating capital have taken on a new form based on mining data and information from a *general intellect*. As in mercantilism, in which profits by transfer were made through violent processes that exploited slave labor and natural resources, we have returned to the same rentier profiteering in the form of info-cognitive extractivism.

Value is not only generated at work but also in every instance of daily life, and this is transformed into

information when large monopolist corporations that control information highways have the capacity to process it and do so. This info-cognitive extractivism occurs through a process that is not coincidentally known as “data mining.” The information that banks have on every transaction in the financial market is as valuable as, or even more valuable than, the money in those banks. Beyond the financial circuit, the processed datum acquires the potential form of capital.

Along with the Internet of communications, there is also the Internet of logistics and things that allows a higher level of extraction of information. The extractivism of data mining co-exists with other, equally violent processes: 1) South-North knowledge transfer due to the net flow of qualified migrants⁽¹⁾; 2) contributions to scientific research from the South that are appropriated by transnational companies⁽²⁾; 3) Biopiracy of the South’s genetic resources⁽³⁾; and 4) extraction of ancestral and traditional knowledge to create technologies⁽⁴⁾. These processes are enabled by falsely construing ideas, ancestral knowledge, and information on biodiversity as scarce goods through ever more sophisticated systems of intellectual property, digital technology systems, and the stock exchange. This panorama has created a new

1. According to Delgado et al. (2016), 76% of all patents of United States-based universities were attributed to a foreign inventor, and of these, multinational corporations owned 93% of all registries (p. 4).

2. “Increasingly, the generators of patents are originating from peripheral countries to such a scale that, according to data from the World Intellectual Property Organization (WIPO), in 2014 approximately half came from these latitudes, despite the fact that about 75% of patents were concentrated and appropriated by multinational corporations” (Delgado Wise, 2015: 10). For example, Codner and Perrota (2018) analyze what they call “the blind technology transfer process (BTTP),” showing that “from the 254 researchers studied, 37.5% (94 researchers) were referenced by their scientific publications on 341 patents” (p. 4). Likewise, Zayago et al (2018) show that although Mexico is in second place, after Brazil, in nano-research in Latin America, there is no appropriation of the generated knowledge through patents or products and/or application by Mexican agents: of the 60 patents linked to water nanotechnology, 56 belong to major transnational corporations.

form of biopolitics over (human and non-human) bodies and lives, in which a substantial part of capital accumulation is based on the erection of worldwide panopticons.

Faced by the threat of the rule of extractivist knowledge, the III Higher Education Conference (CRES 2018), held in Cordoba, Latin America and the Caribbean proposed in its final declaration that: “knowledge is a universal human right and collective right of the people, a public and common good for the sovereignty, good living, and emancipation of our societies and for the construction of Latin American and Caribbean citizenship”⁽⁵⁾

The conceptual transition required to counter the mercantile and private sense inherent in this return of rentier profiteering through info-cognitive transfer and the underpinnings of Ecuador’s Organic Code on the Social Economy of Knowledge, Creativity and Innovation, which sets out another form of rule of knowledge by regaining its public nature and enhancing the virtue of the commons, are detailed below.

From the “tragedy” to the “enhancement and virtue” of the commons⁽⁶⁾

In *Politics*, Aristotle claimed: “...that which is common to the greatest number has the least care bestowed upon it. Everyone thinks chiefly of his own, hardly at all of the common interest.” This idea was recovered, in one way or another, by Scott Gordon in 1954 (The Economic Theory of a Common-property Resource: The Fishery), Garrett Hardin in 1968 (The Tragedy of the Commons),

3. Ecuador’s First Biopiracy Report, drafted by the Ecuadoran Institute of Intellectual Property (IEPI) found 112 patent applications based on genetic resources endemic to Ecuador that were not properly authorized by the respective state institutions. The applications primarily came from the United States, Germany, the Netherlands, Australia, South Korea, Israel, Belgium, France and the United Kingdom. It is no coincidence that these countries normally appeal against international regulations that prevent the undue appropriation of genetic resources and that establish the responsibility to reveal the origin of said resources before the WIPO.

4. The Portuguese sociologist Santos (2006) has labeled the suppression of non-scientific knowledge ‘epistemicide’. However, today, Western science seeks to extract knowledge from ancestral people that leads to patents that offer the latter no benefit or recognition. More than epistemicide, this is the equivalent of ‘cognitive piracy’.

Mancur Olson in 1965 (The Logic of Collective Action), and Robin Dawes in 1973 (Social Dilemmas) to explain a mode of human behavior and social coordination that accounts for a wide array of social phenomena, such as famine, overpopulation, the Cold War, and the relationship between the state and the private sector.

What is at stake in such a theoretical, epistemological and social construct?

The dilemma of the “tragedy of the commons” is based on the paradox that rational individual strategies lead to irrational collective results when there is no cooperation between those involved.

At the core of the tragedy of the commons, the prisoner’s dilemma, and the logic of collective action lies the supremacy of the “free rider” rational logic, i.e. the rationale of those who seek individual advantages by avoiding the “costs” of participation by shielding themselves in the collective action of the majority who work towards a goal that benefits the whole. If everyone’s individual rationality is that of a free rider, then there will be no common good or benefit. As a consequence of this dilemma, the economic and political solution for the tragedy of the commons has been the privatization of the common resources or the Leviathan (state regulation). These solutions have been politically translated – under a binary logic - into the conflict between market and state.

Elinor Ostrom, the first woman to win the Nobel Prize for economics, showed there is a third way out of the tragedy of the commons, which depends on adequate agreements between participants to exploit resources in a sustainable way. According to the late political scientist, the conditions for such a situation to prosper are: 1) provision of clear rules, 2) supervision of the fulfillment of those rules by the participants, and 3) mutual commitment. These conditions imply the social construction of values based on the trust, reputation, and reciprocity of those participants involved in obtaining a common benefit. An alternative form of managing goods in which the state, the market and society do not view themselves as isolated or even antagonistic actors, but rather as articulated for the common good, is also required.

5. To study the conceptual analysis of the defense of this principle, see Ramírez (2018). The CRES declaration can be viewed at: <http://www.cres2018.org/biblioteca/declaracion-final-cres-2018>

6. This section is based on Ramírez (2014).

Like the environment, knowledge is a public and common good of societies. How is such a good to be governed? Cognitive capitalism has built institutions that enable the appropriation of the surplus value generated by social knowledge and by the information produced in daily life through the use of new communication technologies and the institutional structures of intellectual property that govern international commerce today, producing what Michael Heller (1998) called the tragedy of the anticommons. In the realm of knowledge, this tragedy means the underuse of scientific knowledge as a result of the excessive use of intellectual property rights and over-patenting.

Cognitive capitalism has built institutions that enable the appropriation of the surplus value generated by social knowledge and by the information produced in daily life through the use of new communication technologies and the institutional structures of intellectual property that govern international commerce today

An alternative method must seek to build knowledge/creativity systems that are free from social appropriation, i.e. cognitive systems built as shared resources (Ostrom and Hess 2011) and social public goods, not only for ethical coherence but also for economic efficiency. This construction implies a theoretical and political shift from the underlying assumptions of the tragedy of the commons (and anticommons) to rethink alternatives that enable the implementation of a cognitive rule that is pro/common of humanity and ecosystems.

One must start from the fact that, unlike natural resources, knowledge and creativity are not scarce but unlimited, and they do not emerge from pre-existing and exhaustible wealth but must be systematically cultivated or developed. This premise is important because as an unlimited good there can be no over-exploitation of the resource. The imposition of a limit by means of privatization processes is an economic error if we are interested in maximizing the social benefit.

Knowledge and creativity are not scarce but unlimited, and they do not emerge from pre-existing and exhaustible wealth but must be systematically cultivated or developed

The tragedy also becomes a virtue when the assumption that no one values wealth that is common to all is shat-

tered. If knowledge is built collaboratively and for the common benefit, the probability of common knowledge not being valued is minimal or minimized. At the same time, when it is being constructed collectively, the property rights must belong to the community that generates that knowledge, reducing the possibility of sub-exploitation to a minimum and with that the possibility of the tragedy of the anticommons. If knowledge is built privately, the curse of the commons will be hard to break.

In the case of the prisoner's dilemma, in which the dominant strategy is not to cooperate because communication is forbidden or non-binding, an open knowledge system is designed to generate the greatest communication flow, whereby interaction and cooperation will prosper. That is precisely where the radical advantage of a shared knowledge resource system lies (Ostrom and Hess 2011). Cooperation will not only be produced to generate knowledge but to maintain it as a common good.

A shared knowledge resource system promotes other values, beyond economic ones, because it is based on cooperation that does not exclusively aim to generate profits but rather to discover and find pleasure in creation, which can generate relational goods between community members, whereby one surely breaks from the supposed instrumental economic rationality (means-ends), the basis of the tragedy of the anticommons. Following Elster, it would be possible to build a rationality linked to sentiments, passions and sympathy as the driver of collective action for the production of knowledge as a common good. The "other" is my friend or colleague, not my competitor or enemy. The common cause is always fulfilled together with an "other" that has the same goals as the rest of the group. That implies designing institutional networks of cooperative economic behavior that promote the appropriation of common goods by the commons.

For that system to flourish, there is a need to design regulatory frameworks that give way to different types of collective ownership. If the process is shared and constructed in a team, the benefits must also be shared by the participants who worked in the cognitive or creative network, placing the possibility for social benefit at the center.

In the case of the impossibility of the logic of collective action, knowledge in an open system would not prosper due to the coercion exercised over its participants (as

Olson contends) but rather it would flow freely because those involved have common interests⁽⁷⁾. On the other hand, the successful design of the proposed open systems does not depend on them being small groups where a free rider can quickly be identified; instead the probability of a free rider decreases because the benefit lies not only in the result but, above all, in being a part of the process and enjoying the pleasure that stems from that (Ramírez 2003). At the same time, a free rider will struggle to succeed because of the horizontal accountability, which all members of the network practice. Additionally, the rate at which more common goods are created is greater than in private systems due to the interaction between the millions of brains in the network, which, at the same time, discourages and marginalizes free riders.

In short, another form of knowledge governance is required in order to break from the tragedy of the anticommons and give rise to the potency and virtue that a rule of the common goods entails. This implies –paraphrasing Bruni (2010)– ceasing to edify systems where “that which belongs to all” is equated to “that which belongs to no one,” and instead building systems in which “that which belongs to all” is appropriated as “ours”.

Another form of knowledge governance is required in order to break from the tragedy of the anticommons and give rise to the potency and virtue that a rule of the common goods entails

In this framework, the institutional method to break from the tragedy of the commons and the anticommons is the construction of social platforms with open technologies and a regulation that enables knowledge and creativity to flourish as common goods and social innovation. If that design is built in the ideal manner and the common good communities⁽⁸⁾ –overseers and cognitive workers– have thousands or millions of members, then self-management and self-government processes can emerge, not only on a micro scale but also on a macro scale.

7. Note that recognition, reputation and solidarity can also work as selective “incentives”, just as Olson theorized.

8. In this respect, the democratization of the generation of knowledge and investment in human talent in all social strata is fundamental. When we refer to open systems we are also referring to a management of knowledge that must respect the plurality of knowledge (ancestral, day-to-day, professional, scientific, etc.) that exists in society.

At another moment in history, self-management and self-government on a global scale may have been unachievable utopias. But today, the technological and informational conditions, as well as the sociocultural stock for cognitive systems to feature such an institutional design, do exist in other forms than the exclusively state-based or privatized. We could even say that the shift in the correlation of power on a global level lies in making institutional designs visible when they break from the creative rationality of the tragedy of the commons or anticommons (a privatized patent system) and generating alternative designs that enable the “potency and virtue of the commons” to flourish for the good of human living and the planet.

In December 2016, Ecuador approved the Organic Code on the Social Economy of Knowledge, Creativity and Innovation, which groups scientific, technological and innovation systems with those of ancestral/traditional knowledge and intellectual property in one legal text. The fundamental pillar of this legal framework is the recovery of the public and common nature of knowledge (maximizing social appropriation), whereby these are not only individual human rights but also collective rights of all peoples.

The Organic Code on the Social Economy of Knowledge, Creativity and Innovation

Based on the need to break from the cognitive dependency generated through the rule of the anticommons of knowledge, the Ecuadorean government proposed the Organic Code on the Social Economy of Knowledge, Creativity and Innovation (SEKCI), commonly known as *Código Ingenios* and published in the official registry on 9 December 2016.

As opposed to the dominant logic of cognitive capitalism, the social economy of knowledge is based on the following principles:

Difference between cognitive capitalism and the social economy of knowledge, creativity, and innovation

Table 1.

Cognitive Capitalism	Social economy of knowledge, creativity, and innovation
Knowledge constructed as a private good	Knowledge is a common/public good
Knowledge artificially construed as a scarce good	Knowledge as an infinite good
Research and innovations for capital accumulation	Responsible research and social innovation to guarantee individual and collective rights and good living for people and nature
Maximization of profits derived from knowledge by private agents	Maximization of positive externalities derived from knowledge by society
Supremacy of exchange value	Supremacy of use value
Knowledge produced competitively	Knowledge produced in collaboration (in a network)
Technologies for social bio-disciplining	Technologies for social emancipation, environmental sustainability and radicalization of democracy
Intellectual property is exclusively private	Recognition of a plurality of intellectual properties (public, private and collective, i.e. associative, cooperative, communitarian)
Concentrated (monopolist) distribution of the benefits of intellectual property	Social distribution of intellectual property

The *Código Ingenios* has five legal sections and reverses the formula whereby public domain is the general rule and intellectual property is the exception. The standard seeks for knowledge to be an open state of the art, and to regulate the mechanisms to reduce protected matter and increase exceptions. The code is guided by a healthy balance between the rights holder and the democratization of knowledge and culture, whereby it establishes negative observance procedures to defend public access. In the exercise of this right, it grants supremacy to the person who generated the knowledge and innovation rather than the investor.

Intellectual property is not conceived as an end but as a tool for endogenous development, placing the emphasis on mechanisms that allow technological pairing through the legal protection of technology transfer and disaggregation.

As part of the quest for epistemic equality, the code stipulates free and informed consent with regard to ancestral knowledge; and, where appropriate, guarantees fair and equal distribution of the benefits. Its regulations protect other types of knowledge, such as ancestral and traditional knowledge, while also seeking respect for the rights of nature in harmony with the right to knowledge, thus avoiding geopolitically motivated biopiracy processes.

The aforementioned operation is leveraged –among other mechanisms– on a new typology of goods that seeks to value life and decommodify society, and thus ensure that different goods are treated differently. The guiding principles of that typology are summarized in the following table:

Typology of goods for a rule of differentiated knowledge

Table 2.

Type of goods	Type of rule
Goods to satisfy rights	Public interest goods. The state guarantees open access and public use of goods for the satisfaction of basic needs.
Biodiversity and ancestral knowledge	Biodiversity must be viewed as an intangible state asset. Ancestral knowledge is supported by a <i>sui generis</i> protection system.
Strategic sector goods	The state holds the right to declare these goods to be of public interest to obtain any information derived from all non-protected investigation into social patrimony.
Market goods	Access to these goods is regulated by strict intellectual property standards.

Wiki-Public Collaborative Legislation

Following the collaborative logic behind the production of knowledge, the *Código Ingenios* was drafted through a virtual participatory platform in which citizens were able to check the grounds for the proposal, send comments, gather contributions, and propose edits. This “wiki-legislation” process received over 1.8 million visits and 38,000 direct edits of the bill. The code was built within the framework that it advocates: the recovery of public and common rationality of knowledge and collaborative work. Such progress towards participative and deliberative democracy is nourished by the use of e-government tools to generate public and collaborative public processes for legislation or public policy.

For a comprehensive analysis of the results of “Wiki-Ingenios” see Teran, Ramirez et al. (2016).

As opposed to the hegemonic Western understanding of knowledge production, the *SEKCI* articulates scientific/technological production to the humanities (the arts). Eurocentric Western science is founded on a numbed form of education; it educates to reason, not to feel. This kind of knowledge generates “feelingcides”. The *SEKCI* not only centers the debate on the need to create a form of education that teaches and encourages learners to apprehend reality through the senses, but also seeks for intellectual property regulations to recover the public, common and social sense of the arts while protecting the rights of creators over the rights of capital. Thus, for example, the formula for the creation of artwork through dependency or by paid commission – except when agreeing otherwise – is reversed; the work never ceases to belong to the author. Likewise, it promotes societies where economic organization occurs through collective management and strives to guarantee social security for artists, who are rarely formally employed. In line with the aforementioned principles, in the reform of Ecuador’s university system in 2009, the need is established for every program to include interdisciplinary dialogue with the humanities. In the *SEKCI*, knowledge is always written in the plural, not only due to the recognition of other knowledges, such as the traditional and ancestral, but also because it recognizes that the humanities should enjoy the same epistemic hierarchical status as scientific/technological knowledge.

Strategic guidelines for public and social intervention

Based on Ecuador's Plan for the Social Economy of Knowledges and the debate in the context of drafting the declaration for the III Higher Education Conference (2018), the following 11 strategic guidelines for public and social intervention were established:⁽⁹⁾

1. Reassess the social function of science and knowledge to guarantee ecological sustainability, peace, freedom, cultural diversity, democracy, human coexistence, and the reproduction of life.
2. Generate knowledge and democratize access to ensure its best use as a common resource and public good.
3. Promote technological development, responsible scientific research, and the construction of inter-institutional knowledge networks with trans-disciplinary and interdisciplinary approaches, guaranteeing quality and theoretical-methodological rigor.
4. Develop socio-technical innovation ecosystems based on technology transfer, disaggregation, and closing cognitive gaps.
5. Recover, revalue and protect traditional and ancestral knowledge with respect for diversity, epistemic equality, and within an intercultural dialogue of knowledges.
6. Generate new evaluation processes for the production and dissemination of knowledge with relevant standards.
7. Promote sovereign, free and collaborative construction and management of knowledge, science, technology, art, and culture to advance in the realization of regional citizenship and Latin American and Caribbean integration.
8. Develop scientific, technological and artistic capabilities, scientific vocation, a culture of innovation, and love for knowledge among children and young people in the region.
9. Guarantee gender and ethnic-racial equality, equality for peoples and nationalities and for people with different abilities to access the science, technology and innovation system and to effectively participate in the generation of knowledge at all stages of life.
10. Enhance graduate programs aimed at scientific and technological research in the region, with an emphasis on social relevance.
11. Recover the public and common sense of knowledge and technologies for good living in Latin America and the Caribbean, using the intellectual property system in a strategic way.

Conclusions

Info-cognitive extractivism is a return to former methods of accruing private profit by rent-based transfer through processes of pillaging data from biodiversity, the flow of qualified migrants, knowledge generated at public universities or institutions to patent technology, and traditional and ancestral knowledge, among others. Data mining extracts information from material and immaterial life, processes it and sells it through different forms of intellectual property. This new form of extractivism is causing the neo-dependency of countries in the global south, or periphery, on those that own the intellectual property despite the fact that a large number of primary and tertiary resources come from the global south. To tackle these processes of cognitive injustice and global asymmetry, people in South America have proposed the "social economy of knowledge, creativity and innovation" to build regulatory and institutional frameworks that: a) recover their public and common nature by placing social benefit at the center; b) generate epistemic equality by protecting and recognizing the value of artistic, cultural, traditional and ancestral knowledge; and, c) guarantee the rights of nature against biopiracy processes by safeguarding it as an asset of the people.

References

- Bruni, L. (2010). *La herida del otro: economía y relaciones humanas*. Buenos Aires: Ciudad Nueva.
- Codner, R. & Perrota, D. (2018). Blind Technology transfer process from Argentina, *Journal of Technology Management & Innovation*. 13:3 (In press)

9. For a detailed analysis of the specific strategies of each guideline and recommendations for different social actors see http://www.iesalc.unesco.org.ve/index.php?option=com_content&view=article&id=4347:plan-de-accion-cres-2018-2028&catid=100&Itemid=449&lang=es

Delgado Wise, R. (2017). Claves para descifrar el sistema imperial de innovación comandado por Estados Unidos, *Estudios Críticos del Desarrollo*, Universidad Autónoma de Zacatecas, VII:12, .

Delgado Wise, R. (2015). *La cuestión de la innovación en la era de los monopolios generalizados*, Universidad Autónoma de Zacatecas.

Elster, J.(1988). *Uvas amargas: sobre la subversión de la racionalidad*, Madrid: Península.

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*: Cambridge, MS: Cambridge University Press.

Ostrom, E. & Hess, C. (2011). *Understanding Knowledge as a Commons*. Cambridge, London: MIT Press.

Gallegos, R. (2018). Estrangulamiento tecnocognitivo o emancipación de los conocimientos: propuesta para superar la neodependencia en América Latina y el Caribe, *Tendencias de la educación superior en América Latina y el Caribe*, 5.

Ramírez Gallegos, R. (2014). *La virtud de los comunes. De los paraísos fiscales a los paraísos de los conocimientos abiertos*, Madrid: El viejo topo.

Rodríguez, E. & Sánchez, R. (2004). Prólogo. Entre el capitalismo cognitivo y el Commonfare In: Aa.Vv *Capitalismo cognitivo, propiedad intelectual y creación colectiva*. Madrid: Traficantes de Sueños. pp. 13-28.

Santos, Boaventura de Sousa. (2006). *Renovar la teoría crítica y reinventar la emancipación social*, Buenos Aires: Clacso.

Terán L., Ramírez, R. Spicher N; Ron, M. & R. Pazos. (2016). Public Collaborative Legislation. A Case Study of the Ingenios Act, *eDemocracy & eGovernment*, 1, pp. 1-20.

Vercellone, C. (2009). Crisis de la ley del valor y devenir renta de la ganancia. Apuntes sobre la crisis sistémica del capitalismo cognitivo. In Fumagalli, A., Lucarellin, S. et al. (eds.) *La gran crisis de la economía global*. Madrid: Traficantes de sueños.

Zayago, E., Foladori, G., Castañeda, J.D., et al. (2018). Panorama de la investigación y desarrollo de las nanotecnologías para el tratamiento de agua en México, *Revista de Posgrado y Sociedad*, 16:1, pp. 71-88

Part 3

Institutional Perspectives

8. How can universities participate in the changes that are helping to build bridges between different fields of knowledge? What should their role be?

Synergy via Shared Platforms: The International Islamic University of Malaysia (IIUM) Way Forward

Dzulkifli Abd Razak and Lihanna Borhan

Abstract

The debate on whether to integrate or divide the many branches of knowledge, in particular science, technology and humanities, has been going on for centuries. This divide is perhaps in a large part due to the institutional role of universities. One might argue that universities are the most liable party for the existing divide. But on the heels of that argument, one could also argue that universities may be the ones to lead the way towards integrating knowledge. The International Islamic University Malaysia (IIUM) is poised to take on such a role. Established in the modern-day conventional model of a university offering subjects across the board, albeit with the underlying philosophical framework of tawhid (“oneness”), IIUM is embarking on an ambitious project to integrate the different bodies of knowledge in a more formal and organised form – called “shared platforms,” an experimental amalgamation of various fields of study. This chapter will discuss the tetrahedron model of the shared platform in general, followed by an explanation of the four specific platforms. Although the shared platform is seen as one possible manifestation of the tawhidic epistemology of knowledge, the concepts can easily be adapted to other universities subscribing to different philosophical approaches.

Introduction

The debate on whether to integrate or divide the many branches of knowledge, in particular science, technology and humanities, has been going on for centuries. The epistemological discussion of knowledge aside, this chapter will look in depth at the institutional role of universities. One might argue that universities are the most liable party for the existing divide. The conventional model of universities is to compartmentalise bodies of knowledge into different faculties or departments.

Faculty members may collaborate with others from other faculties, but the essence remains that they are separate from and independent of each other. Perhaps then, as institutions that drive this separation, universities may also be the ones to eliminate this separation, and lead the way towards convergence of knowledge. The International Islamic University of Malaysia (IIUM) is poised to take on such a role (Dzulkifli, 2019).

The conventional model of universities is to compartmentalise bodies of knowledge into different faculties or departments

Established in the conventional model of a university, with all the different areas of studies including humanities, science and technology parked under separate faculties, IIUM has embarked on an institution-wide initiative to integrate the different bodies of knowledge into a more formal and organised form — termed “shared platforms.”

The ideal of a converged body of knowledge is not alien to IIUM. In fact, it is the underlying philosophical framework of the university’s education system. As stated in the Code, viz., “the spirit behind this recognition of *Allah* as the Lord of the World (*Rabbal-alam*) represents the apex in the hierarchy of knowledge. All disciplines of knowledge should lead towards being subservient to this truth.” (IIUM Code of Ethics p. 4). It is often referred to as the *tawhidic*⁽¹⁾ perspective of knowledge, namely, the source of Knowledge is one, and as the branches of knowledge increase, the responsibility of each branch is to converge back to the original source of that Knowledge.

1. Tawhidic perspective. The core of Islamic belief is the Oneness of God (Allah), the Creator of all, not just of things physical, but the source of knowledge (Quran 2:31). Subsumed under this is the idea that as the Creator, only Allah deserves to be worshipped, and that all our actions are to move us towards knowing more about Allah so as to better fulfil our intended duties as the vicegerent of the earth (Quran 2:30). Hence it is incumbent upon believers to seek knowledge.

Integration has therefore always been an integral part of the University's existence, if not perhaps the *raison d'être* of its establishment (Mohd Kamal Hassan 2019). One of the earliest and biggest faculties (known as *kulliyah*) at the university in terms of number of students, staff and programmes is the Kulliyah of Islamic Revealed Knowledge and Human Sciences. At other universities in Malaysia, these two areas of studies — Islamic Studies and Social Science — would have been placed separately. IIUM, however, chose from its inception to integrate them in one faculty to emphasise the convergence of knowledge. Another concerted effort towards integration is to combine each academic programme with the Islamic aspects of the respective curriculum. Moving forward, the “shared platform” concepts are being introduced.

So why the need for a shared platform framework? As novel as the strategies described above are for interpreting IIUM's philosophy in an otherwise conventional university, the fact remained that in all other disciplines not described above, and except for the use of English as its main medium of instruction, IIUM very much resembles any other university in Malaysia. Over the years, these areas of studies have remained highly isolated from each other. On the contrary, while at some universities the basic health sciences subjects (anatomy, physiology, microbiology etc.) are taught by one department and attended by students from different programmes such as Medicine, Dentistry, Nursing, Pharmacy etc., learning together in the same classes, at IIUM this is not the case. The practice of integration seems to be limited to within each academic programme, and resources (human, physical, financial etc.) are not shared or integrated in compliance with the relevant Code as mentioned above. The philosophy is there, some implementations are visible, but it is not enough. Hence the Shared Platforms Initiative.

Shared Platforms as an Approach to Fostering Integration

The IIUM's shared platforms are materialised via the Tetrahedron Model where four platforms are interconnected with each other on all sides. The Model emphasises the idea of connectivity, collaboration and communication — all of which are essential elements for

achieving full integration. Although someone may be identified as being in one of the four shared platforms, that person continues to be able to tap into ideas and knowledge from the other platforms and work with their members. Instead of territoriality towards one's area of expertise, the push is now towards inclusivity and partnership — that is, no-one at the university is constrained to their own fields only, but instead everyone is actively engaged with each other in various academic pursuits. Experts from different areas work together towards achieving a fully informed perspective on all issues, covering both breadth and depth as part of life-long learning. In essence, this reflects the earlier state of scholarship in the more than seven centuries of the Islamic Golden Age, represented by scholars such as Ibn Sina (Avicenna) and Al Khindi. They were polymaths who led in many fields, the scientific, humanities and the religious, for they truly embraced the unity of knowledge originating from a single Source i.e., the Creator.

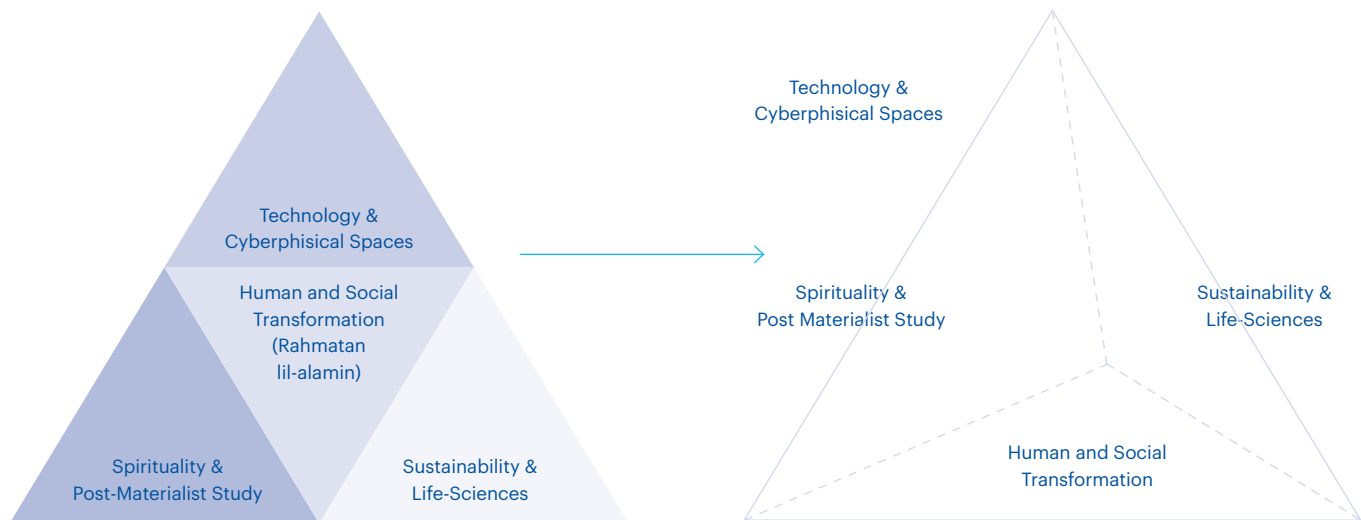
No-one at the university is constrained to their own fields only, but instead everyone is actively engaged with each other in various academic pursuits

In this exercise, IIUM has identified four (4) shared platforms — human and social transformation, spirituality and post-material studies, technology and cyber-physical space, and sustainability and life sciences to collectively reflect the emerging frontiers of knowledge.

The Tetrahedron Model Concepts

Human and social transformation is the base of the Tetrahedron Model, being the ultimate pursuit of knowledge at IIUM. The pursuit and dissemination of knowledge and skills, whether via academic programmes, research, consultation or public discourses, should serve to benefit humankind, as befits the concept of *rahmatan lil-alamin* (mercy to the worlds). When the tetrahedron is unpacked, this platform is positioned in the middle i.e., structurally representing the base of the tetrahedron. It is thus directly linked to all the other faces of the tetrahedron, making up the three (3) remaining platforms. As such, the platforms should tap into the expertise of the rest in order to help anchor their activities in meeting higher global aspirations as expressed by *rahmatan lil-alamin*. The

Figure 1. Tetrahedron model



overarching implication of this is that the experts within this platform should also challenge themselves to be multi-disciplinary, if not transdisciplinary. The aim is for people to become aware of our common humanity (and destiny) so that positive social transformations may be brought into society - not confined just to Muslims but to the entire human community in consonance with the IIUM Code of Ethics.

Humans are essentially biological beings. Regardless of levels of civilisation, the core biological aspect of humans remains the same, if not identical. Together with other life forms, they inhabit the Earth, which needs to sustain itself given the increasing demands placed on it, mainly by humans. Hence, with a deeper understanding of these aspects, the need to be biologically aware is pertinent in order to improve our quality of life. For example, understanding how parasites work may help contain the diseases they bring and promote quality of life. However, simply understanding the physiological aspects of humans, animals, and plants is not enough. Discoveries in these fields need to be interpreted in light of human nature, both at the individual and societal levels, to bring about more meaningful transformation as envisaged by the United Nations Sustainable Development Goals (2016-2030) and therefore raising the quality of life. Hence, the urgency of a shared platform between sustainability and life sciences.

At the same time, the world is moving at a rapid pace, much of which is attributed to the advances in technology. IIUM is cognisant of this and intends to muster and lead the advances in technology, not for the sake of technology *per se*, but to “humanise” it for the greater

benefit of humanity, and not the other way round. This is manifested through the third shared platform i.e., technology and cyber-physical space. When expertise is shared across platforms, “disruptive” technologies that essentially “disrupt” those who are less aware and prepared can be mitigated, if not eliminated by tapping into the knowledge and expertise gained from the other platforms. The IIUM community strives to be more aware and prepared by leveraging on the tetrahedron model and concepts to facilitate knowledge transfer, among other things. Biomimicry is one such example of how nature informs – not just inspires – technology leading to more sustainable solutions and initiatives in transforming society.

As a university rooted on *tawhidic* principles, IIUM chooses not to become apologetic in this era of Islamophobia. Instead, the Islamophobia making its way around the globe should be a catalyst for the University to become more visible, making the Muslim voice heard through the championing of societal and global issues, affecting humanity, not just Muslims. To achieve this, those who are academically committed need to not only be highly versed in the Islamic tradition of knowledge, but equally able to use and apply that knowledge and further inform the future. Hence the final shared platform - spirituality and post-materialist study. This speaks to the notion of rediscovering the lost soul of universities, which may be their academic essence (e.g., Mallard 2002; Moore 2005), or may be their humanizing and human elements (e.g., Dong & Yi 2014; Musick et. al. 2002), and in IIUM’s case, both (Mohd Kamal Hassan 2019).

In short, the shared platform initiatives are the basis for more organised collaboration and integration.

Moving from an isolated perspective, academics at IIUM are starting to work on multi-disciplinary projects that will then move towards a trans-disciplinary approach in pushing the boundaries of knowledge toward convergence

At the same time, they are creating not just new areas of knowledge, but more importantly a new working culture and relationship, and partnering that is integrated and holistic, providing solutions to humankind on a seamless journey towards the humanisation of education (*Insan Sejahtera*).

The Initial Implementation Phase

A change that is wide-ranging, using an institution-wide approach such as this, should not be implemented in one fell swoop and as a top-down didactic move. Change management has to be properly deployed. Hence although the idea germinated from the leadership, the torch has to be passed to and continued to be nurtured by everyone at the university in a collective bottom-up manner. The initiative thus began with a series of dialogues to open up a path towards an institution-wide paradigm shift, spear-headed by the top leadership of the University. Once the idea was well understood and accepted; and began to take shape in the minds of the IIUM community, a university-wide survey was undertaken for everyone to express their interest and commitment. Those who were keen were asked about the level of participation they wished to engage in during this initial phase – whether they wished to be participants, researchers or champions. This self-identification of champions is a core aspect of facilitating a more organised shared platform. They are the ones tasked with leading activities and projects that will move the shared platforms from the realm of conceptualisation to a crystallised and pragmatic form that will then gear the entire University to engage with and complement each other. This university-wide engagement is expected to be a manifestation of the convergence of knowledge as envisioned in its philosophy. The various activities may include dialogues, projects, colloquia and other activities deemed fit to move from a mul-

ti-disciplinary towards a trans-disciplinary approach. Some develop into “flagship” programmes that clearly live up to the university’s expectations as they can also converge with global agendas like the United Nations Sustainable Development Goals or Education 2030. Examples are the emergence of the River of Life (<http://iiumrol.wixsite.com>) and Jungle School (<http://jungle-schoolgombak.com>) programmes, which are expected to further spearhead new and more integrated areas of study using the shared platform. This will make IIUM more engaged, socially responsible and relevant locally, nationally and even globally.

A change that is wide-ranging, using an institution-wide approach such as this, should not be implemented in one fell swoop and as a top-down didactic move

In its most extreme form, the fluidity as well as mobility of staff will be heightened, such that academics are no longer bound to one particular domain related to the *kulliyah*. One foresees academics working not just with academics from other departments, or different universities for that matter, but students too. This will require major structural changes to be aligned with the adopted strategy, followed by change in major policies to institutionalise the transformation. IIUM is committed to this agenda. Some of these include close collaboration between the parties involved, internally and externally, which must be democratic and equitable (as in SDG 17) in search of a common solution taking into account the needs, values and context of the parties involved, which means relevance is as important locally as it is globally. However, the former is always treated with less importance than the latter, especially when a dominant (western-centric) partner is involved. This approach in turn redefined research as “responsible,” encompassing elements of “public engagement”, “open access” and “ethics and governance,” at the very least. Each enhances the meaning and depth of “collaboration” whereby members of the public and community are partners to be engaged throughout the research process from start to end, thus keeping them informed and consulted all the time, making peer-reviewed “open access” an imperative. It further strengthens the notion of integration and partnership across the board. Last but not least, the principles of ethics and governance are deemed essential to ensure that the collaborative work remains transparent and thus accessible, so that the outcome and impact can bring about peaceful, harmonious and just solutions as emphasised in SDG 16.

Concluding Thoughts

The chapter has highlighted the institutional role of IIUM in bridging the existing knowledge “gap” in the university’s academic programmes in line with its aspiration to lead the way towards integration of knowledge. The University is poised to make this a reality by introducing the Tetrahedron Model of “shared platforms”, which are generally shaped by an explanation of four (4) specific themes to epitomise the convergence of knowledge based on the *tawhidic* (“oneness”) epistemology. The shared platform is an institution-wide approach to amalgamate the various fields of studies, and is aimed at serving larger goals and challenges facing humanity. This will make the university more inclusive in engaging the community at various levels – individual, institutional, national and beyond as well as meeting the desired common objective. It is envisaged that the concepts can easily be adapted to other situations that are facing similar challenges to those of a conventional university. Some of the structural and policy changes have also been outlined to facilitate the transformation.

References

- Dong, G. & Yi, L. (2014). Soul confusion and moral education of human beings in technology age. *Higher Education of Social Science*, 8 (1), pp. 82-86.
- Dzulkifli Abdul Razak. (2019). *Leading the Way: Realising the Distinctive International Islamic University*. IIUM Press. IIUM Code of Ethics. <http://www.iium.edu.my/media/19770/CODE%20OF%20ETHICS.pdf>
- Mallard, K. S. (2002). The soul of scholarship. *New Directions for Teaching and Learning*, 90, pp. 59-69.
- Mohd Kamal Hassan. (2019). Islamisation of Human Knowledge: The untold story. Eminent lecture series, 3 May 2019, IIUM.
- Moore, J. (2005). Is higher education ready for transformative learning? A question explored in the study of sustainability. *Journal of Transformative Education*, 3 (1), pp. 76-91.
- Musick, D. W., Nichols, M., Woods, S. Tipton, S. & Nora, L. M. (2002) Toward a more spiritual approach to medical education. *Annals of Behavioral Science and Medical Education*, 8 (2), pp. 101-104.

Overcoming Overspecialisation through Integrating Knowledge, Leveraging Diversity, and a Return to Basics

Haruaki Deguchi

Abstract

The world of academia can be characterized by two growing issues: overspecialisation and the rapid pace of technological change. These contribute to the narrowing of academic fields and the obsolescence of knowledge. In this article, the author argues that in order to address the issue of overspecialization, universities need to integrate knowledge across fields by encouraging joint research and collaborative teams from different disciplines in an approach that brings together the humanities, science, and technology. Coping with the rapid pace of technological change calls for a system of recurrent education where graduates are able to return periodically to refresh their skills and knowledge, and that also provides students with grounding in traditional liberal arts—in other words a return to first principles and foundational knowledge. The author also calls for a shift from a faculty-centred education model to a more student-centred form of education that incorporates discussion, and also stresses the importance of diversity in discussion-based learning.

Where we are: overspecialization and technological advancement

One can characterize the current state of academia with two major trends: overspecialisation and technological advancement.

The first trend—overspecialisation—refers to scholars probing deeper and deeper into their respective fields. Let us look at Japanese history to illustrate this point. It is typically divided into the ancient, medieval, early modern and modern eras. A scholar of medieval history may only focus on one specific time frame, individual, or phenomenon, instead of a broader window of time. However, scholars frequently focus their research

as they progress in their careers, and as a result overspecialisation continues to progress. Although more in-depth study of a discipline is worthy of merit, one side effect is that an overspecialised scholar of medieval Japanese history would find it difficult to understand the era as a whole.

The unending march of technological innovation makes knowledge obsolete in no time at all

The other major trend is the unending march of technological innovation, including digital and information technologies, that makes knowledge obsolete in no time at all. In the context of higher education, this means that even if a university student learns the latest content now, it will be old news by the time the student graduates in four years. If the student is exposed to content that is not completely up to date, it follows that their knowledge will be even more out of step with the latest developments in the field.

An integrative approach to specialisation

What should we be thinking about, given these trends? With regards to overspecialisation, it can be said that some degree of specialisation is necessary. It is important for researchers to delve deep into their fields, but not to the extent that they lose sight of the bigger picture. Given that we do need to have some specialisation, we must be able to place this specialised knowledge in a larger context.

We need to integrate knowledge across fields, and to achieve this we need to strengthen ties across a wide range of disciplines

This brings up another point: We need to be able to integrate knowledge across fields, and to achieve this

we need to strengthen ties across a wide range of disciplines. To take another example from the field of history, what was once considered the most important process in historical research was to provide a holistic interpretation based on a careful examination of primary sources, largely documents or related material. Examining primary sources alone, however, does not enable a complete understanding of history. If one can use research from other fields to determine the temperature of a given era from pollen analysis, then one can also determine what kinds of crops were being grown and when.

Another major resource for primary sources are those excavated from within the earth. Archaeologists in China joke that they can change the course of history if they excavate a big enough tomb. This is because a large excavation of the right archaeological site can yield a treasure trove of information about the period in question. Hence, the field of history is shifting away from analyses based on a careful reading of documents to those like pollen analysis that tap into the power of the natural sciences, or are based on actual artefacts recovered through excavation. This means that history is now an amalgam of the humanities, science, and technology, as opposed to the document-centred schools of thought propounded by historians in 19th century Prussia and the British Empire. In other words, there is a trend toward increasing interdisciplinarity, akin to a shish kebab skewer that connects several different ingredients. Therefore, we can consider this to be another trend.

During the Renaissance, well-rounded individuals were revered. A classic example would be someone like Leonardo da Vinci, who had a wide range of skills and varied interests. So, as we move forward into the future, we may need another Renaissance in which we balance specialisation with a more holistic approach. Since there are only 24 hours in a day, some may say that no one has the time to integrate all the knowledge from a certain field given the sheer volume that has been accumulated in each and every specialisation. This is where joint research comes into play.

We may need another Renaissance in which we balance specialization with a more holistic approach

Continuing with the history analogy mentioned earlier, a team might include historical document professionals, pollen analysis experts, and other specialists, or one could use a computer to run a vocabulary analysis of

a massive trove of documents. In order to work in this way, the creation of joint research teams and harnessing of the latest technology will be increasingly critical for the integration of knowledge. Although we will need to see the emergence of individual universalists like there were during the Renaissance, we will not need to rely solely on these rare talents. We can achieve the same outcome through scholars from a wide range of fields working together collaboratively in joint teams. On top of this, we should use information technology as much as possible to process the ever more massive quantities of data and information gathered from different disciplines and inputs. A two-pronged approach like this to the integration of knowledge is one path that universities will need to pursue going forward.

The creation of joint research teams and harnessing of the latest technology will be increasingly critical for the integration of knowledge

Keeping up with technological advancement through recurrent education

The next order of business is how to deal with the rapid pace of technological change. There is a joke that goes like this: If a university wants to access the latest knowledge in information technology, they can hire the world's leading IT expert to teach at the university, but in two to three years his or her knowledge will be out of date. This indicates just how fast the field of information technology is evolving.

To borrow an analogy from the world of business, we can look at smartphones. Ten years ago, they were still new, so many online business models were designed around getting people to shop and make purchases from their computers. Now, many businesses generate sales income through mobile platforms or browsers. When smartphones first came out, mobile commerce platforms were rare, but now transactions like this are relatively commonplace. In the world of business, major transformations like this can occur in just ten years, and the pace of change is only accelerating.

Universities will need to offer a system of recurrent education that allows learners to go back and forth between university and the real world

How are we supposed to confront these kinds of challenges? Because what students learn in university about the relationship between their studies and

the real world becomes obsolete quickly, we must design systems that enable people to go back and forth between university and the real world. In other words, once someone graduates from university and goes to work for five or ten years, they will find that the world has changed significantly, so we need to offer them options for retraining. Instead of traditional three or four-year courses, this should take the shape of shorter two or three or six-month courses in which they can brush up their knowledge and skills before heading back into the real world. In the future, universities will need to offer a system of recurrent education that allows learners to go back and forth between university and the real world, being designed to incorporate this interactive element.

This is not a new idea, however. One of the oldest universities in the world, Al-Azhar University in Cairo, was founded in the 10th century upon three core beliefs—enrol at any time, take classes at any time, and graduate at any time. What this meant is that students could enrol whenever they wanted to study, take whatever courses they wanted to take, and they did not have to complete the entire curriculum. Once they felt they had learned enough, they could leave, but they could choose to come back at any time. In other words, the ideal university for recurrent education was already in place over 1,000 years ago.

As paradoxical as it may seem, the faster the pace of life becomes, the more important it is for people to be able to return to the basics and rethink things. Namely, they need to be able to set aside what is considered common sense by society and, starting from scratch, analyse the facts and figures on their own and contemplate in their own words what is happening. As Pascal said, ‘man is a thinking reed.’ Because humans have the ability to reason and because the pace of change continues to accelerate, it is more important than ever for people to develop the ability to discern the true nature of things and to think about things anew without being bound by convention.

Therefore, to combat the obsolescence of knowledge we need recurrent education; that is, we need to transform the relationship between the real world and universities into a bidirectional one. Also, universities need to not only provide students with an understanding of new phenomena that are occurring, they need to instil in them the ability to take the ‘long view’ in understanding the historical and social context in which these phenomena arose as well as the ability to grasp their true essence. Although the discussion here is centred on traditional Western-style liberal arts, what is most important is for people to develop a liberal arts approach to thinking. In other words, the ability to allow people to be free, to be human, and to think.

Building a solid foundation with liberal arts

The Al-Azhar approach to recurrent education is one solution. Another solution is to help students develop a solid foundation by focusing on liberal arts. Because the speed of change means that technological or similar skills that students learn will become obsolete in a short time, in addition to studying the latest technologies and acquiring the latest knowledge, it is important for students to develop the ability to return to first principles and think about the true nature of things, and what would naturally occur next. This is especially critical given the increasing speed at which technology and knowledge is changing.

The faster the pace of life becomes, the more important it becomes for people to be able to return to the basics

Bridging disciplines, connecting faculties

The integration of knowledge is necessary in every field. For example, in the field of history, humanities must be integrated with science and technology. Today’s universities have traditionally been administered as isolated bureaucracies, where individual faculties each handle just one field. Going forward, however, they will need to switch to a more interdisciplinary approach. In other words, although individual faculties will remain, universities will need to create connections between them, such as project teams in which people from a wide array of disciplines come together to conduct joint research. This approach should not be limited to university academics, however. These teams could include members from government agencies and private companies, thus creating a public-private venture for research. These are the kinds of open organisational structures that universities will need to pursue going forward.

Universities can play a major role in our ever-changing society, but in talking about the universities of the future, so far, we have only discussed them in terms of overspecialisation, the rapid pace of technological change, and the integration of knowledge from different fields.

Moving toward a student-centred system of education

We must not forget that the provision of education is another role that universities fulfil. We touched briefly on recurrent education, but going forward, universities must be more than just places where professors teach students. Rather, the centre of university-level education must be the students—while research falls mainly under the purview of the faculty. The future of university education will be a framework in which the faculty and staff exist to support a diverse array of students as they learn what they want to learn. The function of teaching or conveying knowledge can be left to computers, artificial intelligence, or even the internet. At Minerva University, which is considered one of the world's most cutting-edge universities, most of the classes are conducted online, but the students engage in immersive learning together all over the world. If students were left to do their learning alone, even the most motivated ones would become lax. The true value of a university when it comes to education is as a place where students can come together to engage in energetic discussions. The key element here is a group of students who want to learn, not just separate individuals. This is what keeps everyone motivated. They can enhance their education by learning from each other.

Therefore, university lectures will need to move away from a teacher-centred model to one in which teaching assistants or other students assume more teaching duties and more discussion is involved. This approach will help everyone to excel. It goes without saying, but diversity is critical for learning through mutual support. With a group of like-minded people, there is little stimulus and little in the way of differing perspective. This is another reason why universities must recruit students from a diversity of countries, cultures, and perspectives from all over the globe, and not only young people, but also adult learners of all ages. The best way to enhance learning through discussion is diversity.

Enhancing learning through diversity

The best way to enhance learning through discussion is diversity

Ritsumeikan Asia Pacific University (APU) in Japan, where I serve as president, is a small university with about 6,000 students, half of whom are international students hailing from more than 90 countries and regions. APU's undergraduate colleges are much larger than our graduate schools, so a clear majority of the student population are young people between the ages of 18 and 23. This 'United Nations of the Young' as I like to call it, is also home to 3,000 Japanese students. Unique for a Japanese university, only about a third of our domestic students are local, hailing from the island of Kyushu where the university is located, while the remaining two-thirds come from the rest of Japan. These factors taken together make APU an extremely diverse university, in both international as well as domestic terms.

Multiple times a year the university hosts the Global Competency Enhancement Program (GCEP), a program for mid-career employees from Japanese companies. The participants spend from two to four months studying at APU and living in dormitories with regular students. GCEP was initially launched to boost the intake of adult learners, but in terms of creating a more diverse academic melting pot, the university needs to explore more programs like this in the future.

Diversity is a key area for APU, so we will continue recruiting students from around the globe, just as we promote discussions and other forms of active learning. We will expand our use of TAs and other kinds of peer learning systems. On top of this, I would like to take advantage of information technology to handle the task of conveying knowledge. It is up to the faculty and staff to create these kinds of systems and then function as moderators to enhance student learning. I believe this is the future of education. Ideally, we will be a university that is open to the community, and like Al-Azhar University, students of all ages can come and go as they please. This is what we aim to achieve here, and more than anything, I think this is the path that universities around the world must pursue.

Conclusions

We face a world where overspecialisation and the rapid pace of technological change contribute to the narrowing of academic fields and the obsolescence of knowledge. *It is essential for us to find ways to encourage joint research teams that draw from a variety of fields, both from within academia but also from public and private sectors.*

With the depth of knowledge that comes with overspecialisation and the birth of new technologies almost every day, it is nigh impossible for an individual to master a range of fields. Instead, we should look to a classic liberal arts foundation that teaches students and specialists alike how to return to the basics, how to approach and analyse problems, and how to think independently.

As higher education institutions, we should look at how *we can integrate different fields of knowledge, seeking a more interdisciplinary approach that brings together the humanities, science, and technology.* Bringing together diverse fields of knowledge is important, but it is equally important to *ensure that university populations provide a diversity of experience and perspective.* Recurring education can contribute to the diversity of experience and perspective on campus while providing value to the university and its stakeholders.

Universities need to let the public know what roles they will assume and what actions they plan to take to this end. University personnel can no longer hole up in their ivory towers. I believe the key is to *create a positive feedback loop whereby universities properly publicise what they are doing to secure support from the public,* which in turn will lead to more investment in education.

This is the context in which I would like to rethink the future of education and research.

The Humanities Center: Synergising Institution, Institutionalizing Synergy

Sara Guyer

Abstract

Across North America, but also increasingly around the globe, in Chile and Argentina, Taiwan and Hong Kong, Lebanon, Australia, South Africa, Ethiopia and the Netherlands, humanities centres and institutes have emerged within universities and colleges of all sizes and budgets as facilities through which interdisciplinary, engaged, and collaborative work in the humanities can be developed and supported. For the most part, these centres work across the structures – schools, disciplines, units, faculties – through which universities operate. It is for this reason that I would like to highlight the importance and centrality of the humanities centre model for addressing the synergies addressed in this report. The university-based humanities centre is the place where these synergies find an institutional home, where they can be tested and explored, and where they are publicised, analysed and practiced. My aim in this chapter is to describe the core features of the form, provide a few examples drawn from distinct local contexts, and recommend continued investment in existing humanities centres and the incubation of new ones in order to support the broad goals of the contemporary university, which is local in situation and global in outlook. Humanities centres are the sites where some of the most significant innovations in – and beyond – the humanities are taking place, in terms of content (i.e., what is being researched), form (i.e., how, where and under what conditions), and aspiration (i.e., how universities can drive social transformation). I will conclude with some recommendations as to how to ensure that humanities centres can continue to incubate and model collaboration.

humanities. Across North America, but also increasingly around the globe, in Chile and Argentina, Taiwan and Hong Kong, Lebanon, Australia, South Africa, Ethiopia, and the Netherlands, humanities centres and institutes (and for the purposes of this chapter, I will refer to these interchangeably) have emerged within universities and colleges of all sizes and budgets as facilities where interdisciplinary, engaged and collaborative work in the humanities can be developed and supported. For the most part, these centres work across the structures – schools, disciplines, units, faculties – through which universities operate. It is for this reason that I would like to point to the importance and centrality of the humanities centre for devising and instantiating the synergies addressed in this report.

Across North America, but also increasingly around the globe, humanities centres and institutes have emerged within universities and colleges of all sizes and budgets as facilities where interdisciplinary, engaged and collaborative work in the humanities can be developed and supported

The university-based humanities centre is the place where these synergies find an institutional home, where they can be tested and explored, and where they are publicised, analysed and practiced. My aim in this chapter is to describe the core features of the form, provide a few examples drawn from distinct local contexts, and recommend continued investment in existing humanities centres and the incubation of new ones in order to support the broad goals of the contemporary university, which is local in situation and global in outlook. Humanities centres are the sites where some of the most significant innovations in – and beyond – the humanities are taking place, in terms of content (i.e., what is being researched), form (i.e., how, where, and under what conditions), and aspiration (i.e., how can the university be a driver of social change). I will conclude with some recommendations for ways to ensure that humanities centres can continue to incubate and model collaboration.

Introduction

My contribution to this report is a reflection on the humanities centre as an institutional form, in particular the opening that it has fostered and the insistent manner in which it has revealed the relevance of the

The story that I am going to tell here begins in 1959. That was the year when the first university-based humanities centres were set up in North America. It was the year of C.P. Snow's Rede lecture, where he defined the 'two cultures.' It was also the year when the University of the Western Cape (UWC) in South Africa, the apartheid-serving university that 'combined the force of instrumental reason and disciplinary reasons to uphold the racial premises of the state' was founded, a university that has moved from being a site of 'apartheid's greatest force and intensity' to one of urgent reinvention through its humanities centre, established in 2006 as 'a space in the university to think its way out of the legacies of apartheid' (Lalu and Murray 2013).

Humanities centres are the sites where some of the most significant innovations in – and beyond – the humanities are taking place, in terms of content (i.e., what is being researched), form (i.e., how, where, and under what conditions), and aspiration (i.e., how can the university be a driver of social change)

1. The First Models: Multidisciplinary Communities and Culture Gaps

As one of the first humanities centres, the Institute for Research in the Humanities (IRH) at the University of Wisconsin-Madison emerged as a grassroots faculty programme in the 1950s. The IRH had several distinguishing features that came to serve as a model for other centres and institutes in North America, and later in Europe, Australia, Africa, Latin America and the Middle East. The IRH's founders, convened in 1957-58, initially took their inspiration from the Institute for Advanced Study (IAS) at Princeton University, and specifically its School of Historical Studies. However, there was a key difference between the Wisconsin plan and Princeton. Unlike the IAS, the IRH was not independent from the university, which the founders viewed as a 'defect,' but rather a part of it, allowing for a connection to graduate education. The other inspiration for the IRH came from the sciences, where research-focused faculty centred their projects around a lab. Aiming to incorporate a humanities-oriented, research-focused project within

universities that was modelled both after the lab-based institute and the university-adjacent institute, this new form, designed to support research across disciplines, was outward looking from the outset.

During the same period, in a rather different setting, Wesleyan University, a small, liberal arts college in New England with an all-male student body, also founded a humanities centre: The Center for Advanced Studies. The focus at Wesleyan was, at its inception, not on local faculty, but on fostering intellectual exchange, by hosting writers and practitioners across disciplines as fellows, who came from the arts and humanities, including Hannah Arendt (who prepared the first version of *Eichmann in Jerusalem* as a fellow), John Cage, and Frank Kermode, but also from an array of other fields and professions. The project explicitly sought to overcome a "culture gap" that resonated with the division of cultures that C.P. Snow, himself an early Wesleyan fellow, articulated that same year at Cambridge.

Victor Butterfield, Wesleyan's president, explained this aspiration in a memo announcing the Center's formation:

We feel that institutions of Wesleyan's type, if they can find the resources, should on principle support vigorously the creative work of some of our very ablest people in the liberating disciplines. We feel particularly that such people should be drawn not only from abroad as well as from home, but from the so-called 'active' as well as scholarly professions. One of our concerns and one of the nation's persisting and serious problems is the cultural gap in our society between the intellectual and the man of affairs. We feel that each of these types has much to learn from the other, that they should come together more often in serious discourse, and that the liberal institution should support the study and writing of our ablest journalists, justices, ministers, industrialists and the like, as well as of professional scholars and creative artists⁽¹⁾.

By 'culture gap,' Butterfield seems to be referring to Snow, who he had met in England in 1959. Sigmund Neumann, the first director of the Center, had access to an early draft of Snow's 'Two Cultures,' and recounted the argument for Butterfield. However, Butterfield's project reveals a translation of Snow's argument. Snow focused famously on the division between literary and scientific cultures, arguing that literary humanists remain preoccupied with individual lives, whereas scien-

1. <https://www.wesleyan.edu/libr/schome/FAs/ce1000-137.xml>

tists, particularly engineers, are interested in improving society through technological innovation and the alleviation of poverty through development. For Butterfield, the culture gap exists not between individual and society, science and literature, but the university and the world in which it exists, the ‘scholar’ and the ‘man of affairs.’ While Butterfield does not explain the downside of the gap between scholarly and active professions, we can imagine that he shared many of Snow’s worries about the future as well as his commitments to improving society and, further, that he envisioned the new humanities centre as a remedy. By creating conditions to foster robust exchange across discursive communities, Wesleyan implicitly sought to make good on the promise of liberal education and liberating research.

In its own way, the IRH at Wisconsin, even in the late 1950s, also envisioned a multidisciplinary and multigenerational community of scholars, although its focus from the outset was internal to the humanities and included only researchers at the University of Wisconsin. This difference is in part due to the scale and reputation of the university. With over 1,000 full-time faculty, the IRH focused its efforts on supporting local researchers at a moment when increasing specialization, disciplinary loyalty, and fragmentation were already changing the shape of academic institutions (Cronon 1970: 227). In addition to being multidisciplinary, the IRH was also modestly, if importantly, international. Not only were several of its first fellows European émigrés, but the proposal for its foundation also identified one of its pillars as the study of American, European and Asian culture.

Both of the first humanities centres established an integrated multidisciplinary community within universities as part of their core project. At Wesleyan, this approach involved an effort to build a community between those based inside and outside of universities, bringing well-known intellectuals from home and abroad to a small, mostly undergraduate campus in order to expose faculty and students to the cutting-edge work of the time. At Wisconsin, the IRH gathered a community of researchers working independently and alongside one another in a configuration that fostered formal and informal exchange across disciplinary lines. Most researchers then and now have focused on what could be called “basic research”, scholarly inquiry, whether disciplinary or cross-disciplinary, that leads to the publication of academic articles and books on topics that represent a multiplicity of humanities disciplines, critical methods, and historical periods. The Wisconsin model could be

viewed as supporting those researchers at the university who would later move outward, becoming (as some did) the Wesleyan Center’s invitees.

These two approaches reflect the commitment of humanities centres to creating new lines of inquiry within and beyond the universities where they are located. While in 1959, these were projects were distinct in shape, later in the century, when many other universities – including Harvard, Yale, Irvine, Chicago, and Sydney, among others – developed new centres, they did not choose between these models, but combined them. In fact, in 1969, the Wesleyan Center was renamed the Center for the Humanities and its focus changed towards supporting local faculty rather than outsiders. At about the same time, the IRH explored a shift from *proximate interdisciplinarity* to a more *ambitious collaborative research* project. E. David Cronon, then director of the IRH, envisioned this enterprise as part of the maturation of the Institute. Like Snow, Cronon viewed interdisciplinary collaboration as a condition for addressing societal challenges. But rather than focusing on poverty, early education and development, as Snow did, Cronon identified a different project, with enduring relevance today: the environment.

In a memo entitled ‘The Institute for Research in the Humanities: Its Past Development and Future Opportunities’, Cronon reported that the IRH ‘serves a broad spectrum of fields and is well-equipped to promote interdisciplinary studies as well as fruitful interaction with the growing number of scholars in the biological, physical, and social sciences who share humanistic concerns in their research and teaching’. Cronon went on to specifically emphasize this interest, one that proved both to be far ahead of its time and an ongoing project:

Because of its interdisciplinary character and its ties to a number of humanities departments, the Institute has a unique opportunity to serve as a bridge between the humanities and other fields of learning. It can thereby help in the much needed effort to re-establish something approaching the once-closely knit academic community of the traditional university. In the years ahead, the Institute proposes to stimulate closer and mutually beneficial ties between scholars in the traditional humanities fields and humanistically oriented scholars in the various scientific fields. The objective will be to strengthen the humanistic component in a variety of broad interdisciplinary projects and programs while at the same time continuing to promote significant research in the traditional humanities fields.

The growing interest in environmental problems, which cut across most disciplinary lines, provides an excellent illustration of how the Institute might serve to focus the contributions of humanists on matters of concern to scholars in other fields. Man's relationship to his environment has been a traditional concern of humanists, for at the bottom it involves such timeless questions as the intersection of spiritual and material values, the balance between ethics and power, and the ethical, social, and aesthetic implications of technological change. (2-3)

Even within the first decade of the existence of the new humanities centres, and 10 to 30 years before most other US-based centres were even founded, at the IRH, the possibility of collaboration between humanists, scientists and social scientists already appeared to be a good fit providing 'a unique opportunity' for collaboration and cross-disciplinary inquiry. Cronon's memo assumes: (1) that the study of the environment has never been divorced from the humanities, but already includes it; (2) that a research institute has as its project a focus on the 'balance between ethics and power, and the ethical, social and aesthetic implications of technological change.' This was when the IRH's founding focus 'to formulate and organise a continuing research program that would directly benefit the University as well as the individual scholar' was transformed into a broader focus on social intervention through the humanities.

There is no clear evidence that the IRH fulfilled this project or that it remains committed to it today. But it did not disappear. Rather, Cronon's understanding of humanities centres as capable of addressing 'the ethical, social, and aesthetic implications of technological change' in a collaborative, multi-disciplinary manner endured, and was fulfilled nineteen years later when the University of Wisconsin established a second humanities centre, the Center for the Humanities (CfH), which convened a more broadly interventionist project with a strong focus on community engagement, advocacy, collaboration and interdisciplinarity. Unlike Wesleyan, an existing centre was reinvented. Even today, the University of Wisconsin-Madison has two centres with distinct, yet overlapping, approaches to university-based research coordination in the humanities.

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2. The Humanities Centre in the 21st Century: Interventions and Collaborations

While Wesleyan brought outside scholars in, understanding that they could transform local conversations, and while Wisconsin's IRH fostered an interdisciplinary community of scholars, and while both projects reflected efforts of increasing scales of scholarly exteriorisation, leading to capacious cross-disciplinary exchange, by the late 1990s and into the 2000s, a new form of humanities centre came into view, revealing how the humanities can engage with the contemporary world.

In this period, university-based humanities centres began to broaden their focus on exchange, beyond connections between individual scholars to include institutional synergies: collaborations with schools, galleries, NGOs, and even the private sector, as well as between centres at other universities, both regional and international. There was increased awareness of the need for hybrid institutional spaces. The criticism of disciplinarity, the incorporation of social-scientific and scientific theories into literary and historical research, and the growing awareness of deconstructive insights into the porous relationship between inside and outside led many to think actively about how the university could reflect these changes. The humanities centre became the place within the university where these ideas could be both explored and applied. Rather than an anomaly, in this period, humanities centres became a core feature of the twenty-first century university. Today, virtually all members of the Association of American Universities, which includes 62 leading US and Canadian research universities, have humanities centres, as do universities all over the world.

In a 2009 essay, James Chandler wrote that ‘the work of a humanities center...tends to be connected both with the new studies and with the more specific interdisciplinary initiatives associated with them’ (738). Chandler explains that the distinctive feature of a humanities centre is that it opens a space ‘to accommodate and coordinate forms of work – often work that reflects changes in research in pedagogy – in a way that is not easy or perhaps even possible within the existing disciplinary-departmental scheme’ (738). In some cases, fields that appeared cutting-edge, like American Studies or Cultural Studies, were first incubated in humanities centres. They now live in their own departments with journals, conferences, designated faculty lines, graduate programs and student majors. In other cases, like the environmental humanities and public humanities, humanities centres continue to be a primary site for focused, radically interdisciplinary research and pedagogy. Humanities Labs at the University of Virginia and Duke University are examples where a platform for collaboration, pedagogy and research introduces the flexibility to undertake multiyear thematic projects. While the growing number of journals, graduate and undergraduate certificate programs, and new books and book series seems to suggest that these areas will become disciplines (or interdisciplines) of their own, something else is also at work here. The collaborative element of these fields is not just a supplement, but a core aspect of their project. The outcome of their research is not just another article or book. Further, these collaborations do not always take place scholar-to-scholar, and their outcomes, which are posing fundamental challenges to the conventions of scholarship through digital archives and databases, documentary films, exhibitions, performances, podcasts and school projects, are not always the work of single authors. Can these fields coagulate into traditional disciplinary forms or will they remain part of the ongoing social and ethical project of humanities centres?

This remains an open question. It is a question that also works the other way round. As traditional disciplines, like philology or even comparative literature, may lose their status as independent departments or units due to poor enrolments and shrinking budgets, it may be that humanities centres will also be the place where fields of inquiry that no longer have a clear institutional home, such as philology, continue to live. Humanities centres, then, are not only the future-oriented space of the not-yet disciplines, but also the home of those disciplines that are no-longer recognised through the

university’s (and the culture’s) conventional values. It is because they are so catholic that these institutions can be supported equally and simultaneously, as is the case at the University of Wisconsin-Madison with its support for basic research taking place across disciplines and in collaboration, for instance on epigraphy or early modern science, and support for engaged, justice-oriented programs on, for instance, food security. These projects follow multiple timeframes and take advantage of a fundamental flexibility and institutional duration that few academic units enjoy.

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At the same time as redrawing the boundaries within the university, humanities centres also redraw the boundaries that surround it – inviting public participation, sustaining public engagement, and fostering new relationships and modes for the humanities. This is not only a North American project, for humanities centres in such places as Edinburgh and Utrecht are also focused on social transformation and ‘impact.’ Perhaps the most visionary example of this work is found in the Centre for Humanities Research (CHR) at the University of the Western Cape. The CHR, like many of the other over 250 university-based humanities centres that have been established since 1959, has added context-driven, cross-institutional collaboration and partnership to its portfolio of projects. As a recent report on the occasion of the CHR’s tenth anniversary explains, it uses the convening and collaborative powers of the humanities centre to address the legacies and ongoing challenges of political violence in post-apartheid South Africa:

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In a rapidly shifting social context of post-apartheid society, the study of the humanities offers creative possibilities for dealing with the challenges of globalisation,

rapid technological change, and the legacies of colonialism and apartheid. To this end, the Centre for Humanities Research (CHR) at the University of the Western Cape is unique in developing partnerships across and between institutions, particularly universities, schools, public arts projects, museums, archives and art galleries, and nurturing future generations of humanities graduates, educators and cultural practitioners...The CHR builds a humanities discourse that...explores the relationship between the human and technology in our contemporary world, especially as this refers to rapidly transforming notions of society and politics. (1)

For Premesh Lalu, director of the CHR, the humanities centre is part of a project of freedom that keeps the university's attention simultaneously on itself and the world. For Lalu, however, this is not only a matter of focusing the university on the world, with the attendant implications of recognition, distance, light and enlightenment, or of addressing the world as an audience or problem, but is a powerful matter of leading the university to find its 'footing' – to inhabit its position, to find its stature and stability and place, which also are the conditions for movement, the very freedom that apartheid constricted and that the site of the UWC, outside of the city and tucked into the Cape Flats, continues to mark. Lalu writes:

The object of the humanities centre is to remain open to ideas in their vitality and to lend these ideas, collaboratively conceived, to the reformulation of the very grounds of always renewing the university. The humanities centre accomplishes this by directing focused and inventive inquiry towards renewing the pedagogic projects of academic disciplines, considering emerging research themes and expanding the range of research questions. It also works towards developing a next generation of scholars, and enabling the university to find a footing in the world towards which it is also oriented. This goal it realises not only by way of organisational feat or individual academic leadership, but as an epistemic driver that eschews standpoints in the interests of itineraries of thought and elaboration of concepts. A humanities centre is at the very core of what it means to explore knowledge committed to the idea of freedom; while recognising traditions of received wisdom, it pushes knowledge beyond inherited ideological presuppositions.

At the same time as training new generations of scholars and revitalising knowledge as freedom, rather than as power, the humanities centre reveals the importance

of partnerships that both facilitate and become destinations within the university's itinerary.

These partnerships are local, regional, and international, and they continue to multiply. Collaboration between humanities centres across the globe, with their distinct histories, languages, orientations and contexts, has become a core project of the international Consortium of Humanities Centers and Institutes (CHCI). Most recently, these have taken the form of multiyear research projects based in Chile, Ireland, Taiwan and the United States with partner centres located in Senegal, Tanzania, India, Croatia, Brazil, Australia, Vietnam, Thailand, South Africa, the United Kingdom and Poland, devoted to cross-cutting themes that include: migration, translation, youth and democracy.

Victor Butterfield, when founding the Wesleyan humanities centre, already saw the importance of exchange to 'close the gap' between the university and the world of affairs. Today, the model he proposed continues to develop. One of the things we have learned along the way is that the gap is not one to close, but to cross, engage, explore, and witness. We cannot assume that there will be no differences between the university and its world, between north and south, rural and urban, but we can – and humanities centres do – recognise that the university exists in the world, a world that demands both reflection and change that cannot be the work of a single individual or discipline, but calls for the ongoing joint efforts of many methods, perspectives, genres and actions. This gap – these gaps – shift and orient us. The humanities centre as an institutional site of openness and movement, rather than undermining the university's project, is instead a site for its orientation, its sustainability, and its survival.

3. For the Future: Conclusions and Recommendations

If universities are to continue to be sites of innovation and societal transformation and if they are to engage their local and global contexts, humanities centres will be core partners in this project. Many in university leadership have already recognized the role that humanities centres can play in guiding the university to the world and in fostering research that cuts across existing norms. In 1959, Victor Butterfield at Wesleyan was the

first among these. He does not stand alone. There are still opportunities for universities in all parts of the world to intensify their support of the over 250 humanities centres that already exist, and for those universities that do not yet have them to work with their faculty to establish centres that are responsive to local and institutional contexts.

Funders – private and state – can play an essential role in this project. The US-based Andrew W. Mellon Foundation (AWMF) has had a transformative effect on humanities centres, increasing access, incubating research, and supporting collaboration. This support has been exemplary, and funders in all parts of the world can build upon the AWMF's investment. While many private and state foundations have turned their attention to development fields or STEM, they should not overlook humanities centres, for they are forging collaborations within universities in areas of health, AI, work, and environment, as well as partnerships between universities and community colleges, state agencies, schools and NGOs. They are uniquely modelled, as David Cronon acknowledged as early as 1970, to lead in these areas.

There are still opportunities for universities in all parts of the world to intensify their support of the over 250 humanities centres that already exist, and for those universities that do not yet have them to work with their faculty to establish centres that are responsive to local and institutional contexts

Finally, funders and policy-makers focused on our increasingly global society should become aware of and invest in global humanities networks, especially CHCI, that foster partnerships between centres from around the world. Since 2012, CHCI, with the support of the AWMF, has organized collaborative, international research projects on democracy, migration, translation, indigeneity and youth. These multi-perspectival projects have convened researchers from six continents in a collaborative agenda that involves both established and next generation scholars. These projects have tremendous potential to generate new knowledge, shape education, and inform policy. They are building on the synergies within universities to multiply the synergies between them.

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References

- The Center for Advanced Studies. (1962). *The Wesleyan University Alumnus* (February 1962) pp. 7-12.
- Chandler, James. (2009). "Introduction: Doctrines, Disciplines, Discourses, Departments". *Critical Inquiry* 35 (Summer 2009) pp. 729-46.
- Cronon, E. David. (1970). "The Institute for Research in the Humanities: Its Past Development and Future Opportunities." *Unpublished manuscript*.
- Center for Advanced Studies Records, Collection #1000-137, Special Collections & Archives, Wesleyan University, Middletown, CT, USA.
- Lalu, Premesh and and Murray, Noeleen. eds. (2013). *Becoming UWC: Reflections, Pathways, and Unmaking Apartheid's Legacy*. Cape Town: Centre for Humanities Research.
- Lalu, Premesh et al. (2019). *Revitalizing the Humanities: A Retrospective of the Centre for Humanities Research*.
- Centre for Humanities Research. (2017). *Ten Year Review of the Centre for Humanities Research Report* [[EN CURSIVA]]. University of the Western Cape. *Unpublished manuscript*.

Case Study — Synergies between Humanities and Technology Outside of the Classroom

Jooyoung Kim and Farrah Sheikh

The Academy of Mobility Humanities (AMH) generates debate on issues of humanities and technology through its flagship research project, examining the co-evolution of human beings and technology from a mobility humanities perspective.

Our interest in the synergies between the humanities and technologies stems from our view that rapid technological advances have a profound impact on the form of human life, and that a human-centered critical approach to these developments can further our understanding and awareness of future mobility mechanisms, encouraging the co-evolution of human beings and technologies in more ethical ways.

This project involves in-depth engagement with many pertinent issues facing Humanities in society including increasing human isolation in an era of high mobility and technology. Going beyond the Ivory Tower, we aim to create synergies between issues of technologies and humanities relevant to the classroom and everyday life. As a severely under-researched field, ours is the first project of its kind in Korea. The AMH is attempting to accumulate and share our research findings across various levels of society from the academic community to the general public by establishing a civic education organization, the Mobility Humanities Education Center (MHE) as part of our wider research agenda. Recognizing the need for two-way dialogue between scholars and the general public, civic education and engagement have played a key role in our research plans from the very beginning.

Korean and international researchers from the fields of literature, geography, philosophy, anthropology and others are actively engaged in this project, developing fresh perspectives based on their individual fields of research. Additionally, the project is supported by a Korean advisory group consisting of experts from the fields of kinematics, climatology, mobile technology and imaging technology. Taking a broad worldview,

our project also engages international mobility-oriented researchers who are interested in furthering our Humanities-Technologies agenda.

The main aims of this project include building a body of interdisciplinary research on the notion of mobility humanities. Next, we aim to share our research findings in a variety of formats, with civic education being a primary outlet for promoting our work. Thirdly, we have established the first Asia-based mobility humanities research network, the Asia Mobility Humanities Network (AMHN) as a way of bringing scholars from across the world together to share and develop ideas, activities and perspectives.

As we have alluded, the main beneficiaries of our civic outreach efforts include the general public. We are able to connect with everyday society through free programmes organized by the MHE. As we are at the early stages of our work, the first step is to build a strong foundation of knowledge related to mobility humanities and its relationship to technological and human development. Two significant results have come out of these outreach efforts. Firstly, our “Mobility Hi-Story 100” programme will develop and share 100 hours of free lecture content through the MHE. 40 hours of lectures are already being given on the following topics:

1. Mobility technology and citizen participation politics (5hrs)
2. Mobility of crops and world history (5hrs)
3. Mobility ecology for real adults (10hrs)
4. Mobility through spatial theory and digital cultural map development (10hrs),
5. Mobility age, social philosophy of urban community (10hrs)

Keeping true to our commitment to learning outside of the classroom, the content of these lectures has been especially created to deal with real-life issues, noting

interesting points of conjecture between technology, science and the humanities. For example, one class covered the topic “How was the Internet born?”

The second significant result of our outreach efforts was on 5-9th November 2018, where a week-long mobility humanities festival was held, bringing together people from all walks of life, from primary school pupils to older people. We engaged with humanistic issues of societal change, representation, media and the production of knowledge through a series of free-to-enter events, taking the Humanities out of the classroom and onto the streets. Mobility Humanities Week included a public speaking contest in which high school pupils debated humanistic issues. It also included a book fair, photography exhibition and a guided walk accompanied by an academic lecturer. Through this festival, participants were encouraged to engage with and explore Humanities issues in new ways both through the body as well as the mind.

This case study reflects the first year of a 7 year project, so challenges were expected. However, we were able to lay the foundations of an outreach course through MHE in order to connect with civil society. As we advance through the university system as well as experiential learning, we are now working on the next phase of the project, which aims to approach the general public in more diverse ways, recognizing that outreach needs to reflect different learning styles and be accessible in more varied ways.

Further information: <http://www.mobilityhumanities.org/main.html?lang=EN>

Case Study — The Euro-Mediterranean University of Fes (UEMF)

Manale Adnane

The Euro-Mediterranean University of Fes (UEMF) is unique in that it creates a unique student profile in addition to mastering the chosen course material. This unique profile is based on seven pillars:

- Multilingualism that promotes the ability to communicate using at least two languages in addition to the mother tongue.
- Multiculturalism whereby all programs have courses on EuroMed history, civilizations and heritage.
- Entrepreneurship that promotes the development of innovation and creativity.
- International mobility with partner EuroMed institutions that gives us the chance to benefit from two kinds of education system, whereby the host university and its city/country teaches other ways of thinking, other cultures and other civilizations.
- Digital and Multimedia environment that promotes the use of new technologies for research and communication.
- Eco-citizenship to raise awareness of sustainable development and environmental issues.
- Social responsibility that focuses on involving students in social projects.

These pillars give social and humanistic value to the chosen training. They give all students the opportunity to be open to all religions, genders, cultures, beliefs and colors without discrimination and encourage gender equality by giving equal opportunities to all, as well as offering scholarships to brilliant students that especially come from low-income households. The EuroMed University of Fes has also managed to bring countries together by recruiting people from all over the EuroMed space, so we can benefit from international training in Fes.

At the UEMF, students are attracted to the Architecture Program because of its uniqueness in converging three main disciplines:

- Engineering sciences, Human and social sciences and Arts.

This is because while the Engineering Sciences are essential to ensure the stability, safety, sustainability and eco-friendliness of buildings; the Arts ensure the esthetic quality of our designs; and Human and Social Sciences are the beating heart of architecture. Hence, our main goal is to design pleasant, comfortable architectural spaces and to offer the right response to each particular human need in the knowledge that those needs cannot be treated superficially but require in-depth knowledge of human specificities.

After a year and a half of the program at the School of Architecture, Design and Urbanism of the Euro-Mediterranean University of Fes, we have already witnessed several humanistic experiences, such as international partnership workshops that include students from different cultures and countries to share knowledge, to discuss different ideas, to discover other cultures and other personalities, to build relationships, to improve our ability to work in groups, and to seek and to find, together, the best approach to designing the future of humanity.

At EMADU, our students also have the chance to study abroad for one to three semesters at partner universities and architecture colleges. The main goal of our program is to provide the necessary tools to train qualified architects who are able to contribute to the design and organization of the living spaces required by the people of the 21st century, and to do so in way that respects the environment.

So as future architects coming from a EuroMed university, we would like to help to bring people, cultures and

EuroMed countries together by designing spaces that will encourage social interaction and open-mindedness, since architecture is made for human beings and drives our emotions. We share a common history and a common culture, we are one big family with mutated knowledge and nationalities, and we should act together as one.

That is why our university is becoming our home.

We are also able to work and grow in a pleasant environment thanks to our president, director, teachers and students. We help each other, encourage each other and work together to develop our skills and increase our productivity and performance.

For further information, please visit the website:

www.ueuromed.org

Case Study — Cross-Disciplinary Study Abroad Programs: The Case of James Madison University

Lee Sternberger

The Center for Global Engagement at James Madison University offers students a number of study abroad programs that offer interdisciplinary courses. Why have we undertaken this approach? Over our 40 years of providing study abroad opportunities, we have learned that the students and the university community benefit from the interconnected knowledge, experiential learning in interconnected contexts, deeper learning, learning that requires greater critical thinking to connect ideas from different disciplines, and the intersection of knowledge that such an effort makes possible. Such programs represent the epitome of the underlying philosophy of international education at JMU. While they involve curricular, financial, and logistical complexity, the end products are high-quality programs that represent diversity of thought, instruction, and ways of viewing and understanding the world.

We have made this interdisciplinary approach a priority because our goal is to develop and implement the most effective study abroad programs that lead to greater awareness/tolerance of differences (in opinion, political/economic systems, cultural practices, belief systems) and to create programs that lead to greater self and other understanding, and greater global awareness. We have implemented this interdisciplinary approach through the deliberate integration of more than one discipline and faculty members from that discipline into a given program. Experiential activities reflect both disciplines (with both faculty members involved), and thus students learn, in practice, how the disciplines intersect.

To continue this effort, study abroad team members discuss the idea of interdisciplinary programs with faculty who inquire about developing a new study abroad program. They encourage faculty directors to consider many things when creating a study abroad program – and one of the most important aspects is academic credit. Faculty should ask themselves:

- What credits will be most appealing to students?
- Will I cross-list my course with credits from another major?
- Which major makes the most sense for this type of program/location?
- How can I develop a program with long-term success in relation to the academic credits offered?

JMU's Honors College programs abroad offer a good example. The multidisciplinary approach of the Honors study abroad programs originated from the nature of the Honors College, which requires Honors students to complete two seminars of three credits each. Having two faculty from different disciplines participate in study abroad programs for Honors satisfies both seminar requirements and works in a positive way for Honors students.

Practically, team-taught multidisciplinary approaches to study abroad offer many benefits to students:

- In an intense short-term program, multiple faculty with different approaches can provide some balance and perspective.
- The experience of studying abroad is so rich and multi-faceted that a multidisciplinary course can better reflect that complex experience and invite students into more aspects of the country or culture they are studying.
- For courses focusing heavily on a historical period rather than the present, the more expertise the faculty can bring, the more complete the picture we can provide for the students.

Since 97% of Honors students complete an Honors interdisciplinary minor, interdisciplinarity is built into the program for a significant portion of Honors students.

Further benefits of interdisciplinary and/or team-taught instruction in study abroad contexts:

- A multi-faceted approach to complex ideas/phenomena encountered in a novel context. This kind of kaleidoscopic instructional technique can for students immersed in a new/disorienting cultural context provide a rare opportunity to frame human social interaction in a fresh way and to recognize the many ways in which people share a common humanity while also creating divergent systems of meaning.
- An opportunity for students to witness how their instructors differently navigate not only their intellectual pursuits but also the practical demands of living away from home.
- A chance to model for students how one might engage intellectually with the world while avoiding the provincialisms of narrowly-defined academic discipline-based approaches.

Other examples of CGE study abroad programs with interdisciplinary academic credits:

- Argentina (History, Political Science, Spanish Language, General Education)
- Australia Integrated Science and Technology (Engineering, Geography)
- Canada, Montreal (Music, English, General Education)
- China Business (Business, History)
- East Africa Field School (Anthropology, Geology, History, Integrated Science and Technology, Sociology)
- Ghana (Anthropology, Art History, English, History, General Education, Political Science, Psychology, Religion, Communications, Social Work)
- Ireland STEAM (Biology, Dance, Theatre)
- UK London Honors 3 (Economics, University Studies)
- Spain Barcelona Honors (History, Foreign Languages, Literatures, and Cultures)

As more students are choosing careers beyond their field of study, having interactions with diverse colleagues and peers is all the more necessary. Interdisciplinary courses appeal to a broader audience and offer programs that will prepare students to succeed in a globally connected world, no matter what their major or minor.

James Madison University

www.jmu.edu/

James Madison University, a public university located in Virginia's Shenandoah Valley, has an undergraduate enrollment of 20,798 and a graduate enrollment of 1,888. The university is comprised of seven colleges serving undergraduate and graduate students. U.S. News & World Report ranks it #2 in the list of the most innovative regional universities, and it tops the list of most recommended universities in the U.S., according to *The Wall Street Journal* and *Times Higher Education*.

When James Madison University began life in 1908 as the State Normal and Industrial School for Women at Harrisonburg, no one could have imagined that today JMU would welcome women – and men – from around the nation and the world to teach and learn here; send our students and faculty forth to study, instruct, and volunteer in more than 73 countries; and build a world view into the fabric of the curriculum and the campus community.

The process of internationalization at JMU has succeeded because of the combined and concerted efforts of individuals at all levels across the campus: faculty members with the passion to forge relationships throughout the world and to bring a global outlook into their classrooms; staff members with the skills and determination to reinforce these challenging changes; and administrators – department heads, deans, vice presidents, the provost, the president, and the Board of Visitors – with the wisdom to support and encourage these efforts, both philosophically and financially.

The Center for Global Engagement

www.jmu.edu/global/

The Center for Global Engagement (CGE) serves as the central university office concerning international education, with oversight of all James Madison University and non-JMU study abroad programs; visa and reporting processes for international students and scholars; and the development of curricula, faculty experiences, and programs that address international issues and assess international education programs/experiences. Under-scoring JMU's vision to be the national model for the engaged university: engaged with ideas and the world, the CGE is committed to the principle that international experiences and perspectives are essential to any under-

graduate and graduate education. To that end, the CGE promotes and encourages critical awareness of world issues; knowledge of and an appreciation for other cultures, languages, and belief systems; global community; and commitment to engagement at the international level, that we may educate active and responsible global citizens. The mission of the CGE is to broaden world-views and promote global understanding for the JMU community by cultivating, facilitating, and supporting global engagement at home and abroad. The vision of the CGE is to make global experiences – at home and abroad – attainable for all of the JMU community.

CGE Values:

- Global Learning – Increasing awareness, knowledge and understanding of diverse cultures and people and global systems and issues
- Innovation – Being creative and open to new ideas, processes and solutions
- Advocacy – Publicly supporting, recommending and persuading
- Collaboration – Working together with diverse groups and individuals at home and abroad to maximize our strengths, resources, and effectiveness
- Sustainability – Assuring the continued presence and active development of global education at JMU
- Open-mindedness – Being willing to consider differences and ideas

Case Study — Humanising Higher Education: Transforming the Co-Curriculum as the Core-Curriculum at the International Islamic University Malaysia (IIUM)

Zainal Abidin Sanusi

Formal university curricula are getting more complex and diverse as the world's issues are getting more complicated and interlinked. In responding to this demand, some subjects have become so specific and technical that they may have neglected the purpose of their knowledge to society. In some cases, subjects are highly commercially driven and minimal attention is given to the values that they need to inculcate. Transformation is needed to humanise the curriculum and bring back the original purpose of universities and education.

At the same time, the informal curriculum, also called the co-curriculum, has been the platform to complement core disciplinary subjects and inculcate all the soft skills. But these co-curriculum activities are somehow structured and executed with less significance and loose institutional support, rendering these activities less impactful. However, with the increased complexity of issues, the need for soft skills is receiving more dynamic attention, as systems thinking, transdisciplinary cognitive skills, leadership skills and communication skills are becoming more critical than cognitive and technical ones. Hence they should be at the core of education, and not a co-learning process. Unfortunately, these skills are not taught in the core curriculum and not easily acquired in classroom or laboratory environments. It is therefore beyond imperative that the role of the co-curriculum as part of the core education process should be strengthened. It is for purposes of such a change that IIUM is gradually shifting its role towards structurally balancing inputs and processes to ensure not only pure academic excellence among graduates but also, and equally if not more importantly, holistic excellence.

The IIUM's objective is to redefine the concept of education practiced in a liberal and secular environment by integrating Islamic revealed knowledge (knowledge directly based on the Holy Quran and teachings and practices of the Prophet) and human science (derivative and interpretive cognitive skills). It aspires to produce better quality intellectuals and good character to serve as agents of comprehensive and balanced progress as well as sustainable development in Malaysia and the world.

Specifically, IIUM has put forward three transformational programmes for this purpose. The first initiative is focused on creating an *ummatic* worldview. *Ummah* is an Arabic word literally defined as 'community' which technically implies a perspective that is based on concern towards the five pillars of human existence – people, planet, partnership, prosperity and peace, that sees every human being as a member of the ummah. The ummatic perspective sees all human beings as one group of global citizens coming from diverse backgrounds, ancestry, locations and nationalities. In alignment with the spirit and concept of sustainable development, the *ummatic* worldview emphasises an intergenerational perspective whereby this earth should be perceived as a trust to be taken care of and pass on to the next generation in the same condition as, if not better than, we received it. In order to build this worldview among students, several subjects are made compulsory, which can be grouped into two levels – Ministry of Education required courses and university required courses. The ministry required courses that are compulsory for every university student in Malaysia focus on preparing the young generation for a nation-building process, especially in terms of social-cultural sustainability. Meanwhile, the university required courses are Ethics and *Fiqh* (Islamic

Jurisprudence) and Islamic Worldview, Knowledge and Civilization. What is unique about these two courses is, in contrast to normal classroom lectures, it is part and parcel for them to feature direct engagement with the community to apply and reflect upon the knowledge acquired from the classroom setting. The subject is as theoretical as it sounds, but engagement with the community brings in the fundamental understanding needed for the student to truly appreciate community needs. This makes the subject very 'head-on' (intellectual component), 'hands-on' (practical component), 'heart-on' (affection component) and 'content-on' (technical component). Through this approach, the students are not only grounded in strong theoretical understanding but tested with realities from societal life.

The second initiative towards integrating the co-curriculum as a core education process is known as '*usrah*', which is literally defined as 'family' (the activity is formally known as *halaqah*, which linguistically means 'circle'). An *usrah* is often a religious gathering or a conventional study circle. However, at IIUM, *halaqah* is structured as the main co-curriculum activity addressing contemporary issues, especially those related to sustainable development, in a very dynamic way. Being an Islamic university, fundamental knowledge is inevitably based on Islamic teaching and aims at strengthening the spiritual foundation of the students. In contrast to the conservative approach of religious discourse, *halaqah* is designed to link the fundamental teaching of Islam with society's current needs. It serves as a dynamic and progressive learning community. One example is the issue of poverty eradication and Islamic teaching about it and ways to solve it on the ground. All students must register to join a *halaqah* in 4 of their 6 semesters at university. *Usrah* is not only compulsory for all students but also a graduation requirement, thus emphasising the importance of knowledge and action, university and community. Each *usrah* consists of 20 students from different disciplines to ensure exchange of ideas across different schools of thought and promote diversity among the members. The *usrah* has four different levels. Level 1 discusses fundamental knowledge on Islam and spiritual aspects and the following levels focus on its application, including project planning, culminating at Level 4 with execution of the project. This project is not only intended to give communal services but is also designed to empower the community economically or socially. Through the integrated core and co-curriculum, the students will find continuity and coherency in their

learning processes, which is a highly critical condition for an impactful education.

The third initiative is a university-wide approach to humanizing student learning experiences whereby the research process, teaching and learning journey, and community engagement activities, are structurally linked. The university has 29 projects designed to contribute to the SDGs, thus transcending its boundaries. While all students are required to do research for their degree, the projects must be directly or indirectly linked to the 29 projects. The same applies to the community engagement projects and teaching and learning process. In doing so, it is hoped that the whole university will integrate its spectrum of knowledge, and that such connectivity can break the perception of it being an ivory tower. With this system, IIUM hopes to nurture balanced and holistic students.

9. Humanities are not only active in the university sphere, but are also encountering increasingly more space in cultural institutions and industries. What relationship must the university system have with these other entities? Is it possible to conceive an institutional ecosystem that is able to overcome the dualism between universities and society?

Museums and Collections, Epistemic Convergence and Higher Education

Andrew Simpson

Abstract

This paper argues that creative use of material collections in higher education has the potential to significantly counteract the marginalisation (or residualisation) of the humanities in many national university sectors. Material collections have been at the core of knowledge-based organisations since antiquity but their cross-disciplinary utility was lost during the specialisation and epistemic fragmentation of the Enlightenment, particularly during the 19th century. It has been further obscured by the recent marketization of higher education and the focus on quantification that accompanies competitive neoliberal management strategies in the sector.

The historic connections between objects and knowledge are outlined, followed by brief notes on the epistemic value of the museum and collection methodology. It is argued that cross-disciplinarity is enabled by this methodology because the museum and collection construct is a culturally situated activity reflecting how knowledge enterprises, including science and technology, are cultural endeavours. Universities are complex human organisations and their structures primarily reflect current or recent past epistemic essentialism rather than anticipating the future. Most material collections in higher education originated to support specific disciplinary instruction. This limited application is retroactive and only reinforces existing specialisms.

Material collections in higher education therefore need to be lifted out of their disciplinary restrictions to undertake a merged epistemic role in supporting the tripartite mission of teaching, research and engagement. Individual examples of each of these that illustrate new forms of epistemic fluidity between science, technology and the humanities are given. But it is argued that to enable a focus on the major existential crises of our time, the power of the network needs invocation. UMAC (University Museums and Collections), an international committee of ICOM (International Council of Museums), encourages networked alliances across the globe and across different knowledge systems to facilitate this.

Materiality and the nature of knowledge

Reasoned argument based on observation is an Aristotelian tradition born in antiquity. Objects with a collection context or museum methodology have always been associated with the generation of knowledge. The “cabinets of curiosity”, the forerunners of the modern museum, were constructs for the elite to proclaim their connection to knowledge of the world. It is therefore natural for universities, as knowledge-based organisations, to collect material elements of the world, specimens and other objects, to foster curiosity and generate research questions. It is a scholarly tradition that stretches back to the Renaissance and probably much further (Boylan 1999).

Universities were amongst the earliest public institutions to house collections. In terms of the familiar museum structures and functions, Oxford’s Ashmolean Museum with collections of rocks, animals, plants and antiquities first opened in 1683. One of the earliest modern museums is, in fact, a university museum. It formed a specialised academy in its own right as a centre for scholarship (MacGregor 2001). This model has been replicated all over the world. Similar Renaissance edifices with extensive organisational histories can be found throughout the European higher education sector. The affinity between knowledge and collections of objects is undoubtedly an enduring relationship.

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One of the important and sustained characteristics of the collection context and museum methodology is that while objects and specimens can be the basis for the generation of new knowledge, they also become the historic record of each intellectual breakthrough or advancement, the material evidence of the history of

human endeavour in the sphere of ideas and contestation about our understanding of the world and our place within it. As such, collections can be the template for testing new ideas or generating new constructions of knowledge.

The grand taxonomic endeavours of Linnaeus at the University of Uppsala established a basis for understanding botanic and zoological classification. Identifications relied on observation and comparison, and collections were essential for scholarship. Similarly, the acceptance of Darwin's evolutionary ideas, one hundred years later, as a framework for understanding the diversity of life in the nineteenth century was also reliant on the comparison of specimens. At the same time, through the studies of artefacts recovered from archaeological excavations, the scholarship for an understanding of the Prehistoric, Egyptian and Classical periods was developed. All of this required comparisons of objects. Reference collections were the central focus of university research.

The generation of knowledge does not happen in a cultural vacuum. It is enmeshed with the transmission of knowledge as seen in the combination of the first and second mission of universities. Some of the earliest university collections and museums from the 16th century were established to support teaching in medicine and pharmacy. Universities have also been the home of anatomical theatres, botanical gardens and astronomical observatories. All of these require material collections for pursuing knowledge generation and transmission. Objects and collections add extra dimensions to learning that are simply not available through other means of non-textual scholarship. They can be triggers for exceptional and unique learning experiences with the potential to relate, bind and integrate contextual narrative about culture, science and society.

The primacy of the object as the centre of intellectual life during the Enlightenment is well represented by Harvard's late 18th to early 19th century Philosophy Chamber. Harvard assembled a collection of paintings, portraits and prints; mineral, plant and animal specimens; scientific instruments; Native American artefacts; and relics from the ancient world. These objects were displayed in rooms adjacent to the college library in the centre of campus. The largest space was called the Philosophy Chamber, named for the cornerstone of the Enlightenment era curriculum of natural philosophy that wove together the manifold disciplines of the

sciences to explain physical phenomena (Lasser 2017). The collection and the chamber played a vital role in teaching and research at Harvard, while serving as the centre of intellectual life in the region for over 50 years.

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Objects have been described as "sticky with meaning" (Simpson 2014a), and individual object engagements can be construed as a unique transaction of intrinsic and extrinsic meaning between observer and observed. But in a museum or collection context it is also the relationships between objects that can illuminate new insights. It has, however, also been noted that, in the museum context, objects have a dual character, or contradictory nature (Thomas 2016). On one hand, they are definitive, observable, readily described and immutable; on the other they lack fixity, are readily re-contextualised, multiply reinterpreted and ascribed highly variable values in their engagement with our ever-changing knowledge systems. This tension between object and context makes them both effective mediators of meaning and educational tools (Thogersen et al. 2018).

Objects in collections as generators and transmitters of knowledge can bring different times to life and provide insights into different ways of knowing the world. Despite a rapidly changing pedagogic landscape, it has been argued that object engagement is a fundamental learning strategy with significant cogency (Simpson 2012). Their pedagogical utility is derived from the contextual ability to link meaning between different disciplines and knowledge systems.

At the end of the twentieth century and the start of the twenty-first, we have seen knowledge democratised, higher education now reaches beyond elites and is available to many. During this time there has been rapid growth in the global population, the number of universities and the number of museums (Simpson 2014b). So if objects in collections help us to understand the world and our place in it, if they are conduits to universal knowledge, we should anticipate their presence to be ubiquitous throughout knowledge-based organisations such as universities and broadly across all academic disciplines.

Despite the fact that we are still discovering how numerous academic museums and collections are, there is clearly no global institutional and disciplinary evenness and ubiquity. Instead the university museum and collection landscape looks idiosyncratic and chaotic. The reasons for this are both historic and contemporary.

Knowledge fragmentation and the death of the humanities

Science played a central role in Enlightenment discourse with the belief that the expansion of knowledge, the application of reason, and dedication to scientific method would result in the greater progress of humanity. The expanding economic opportunities from global exploration and industrialisation were readily interpreted as confirmation of this narrative. New specialisms emerged with the establishment of many scientific societies. Disciplinary specialisation became embedded in the process of the application of knowledge underpinned by the rationality of empiricism. Collections grew apace in museums throughout Europe and North America as empirical evidence to test hypotheses.

Laws and theories had to be formulated by means of induction from phenomena. Conjecture and metaphysics essentially became irrelevant during this period. This, however, is antithetical to the potential of objects and the museum methodology. These historical developments make sense if we consider the process of induction to be contextually limited in terms of object and museum theory as they supplanted the contextually open process of observation and conjecture of the preceding era of natural philosophy. In terms of museum theory, the process of bringing objects into a museum collection can be interpreted as one of de-contextualisation and re-contextualisation, whereas, the marginalisation of metaphysics is possibly only a process of de-contextualisation.

So while new learned societies and knowledge-based institutions groaned under the weight of rapidly accumulating material collections, it can be argued that their contextual potential in terms of their broader capacity for mediating meaning and understanding was essentially sidelined. Annual reports of learned academies that collected during this period can be characterised

as little more than lists of acquisitions as context was stripped from objects entering collections.

Maxwell (2018) shoves the responsibility for this clearly at the feet of Newton, who sought to transform his great work in natural philosophy, *Philosophiae naturalis principia mathematica*, into a work of inductive science. He argues that modern science was born of natural philosophy and gave rise to specialisms such as psychology, anthropology, sociology, economics, political science, linguistics, logic and cosmology, all subsequently established as independent disciplines

There is, of course, a tremendous body of literature about the historic development of specialisations during the period from Newton to the 19th century (e.g. Cohen 1994). This is not the place to assess Maxwell's (2018) contention about the nature of empiricism and the impact on the structure of modern systems of knowledge. Despite the methodological importance of induction, there was, however, an extensive range of other associated social, cultural and technological factors that undoubtedly also played significant roles in driving increased specialisation during this period.

Over the last decades of the twentieth century and the opening decades of the twenty-first, as knowledge has become democratised and higher learning available to many, we have witnessed an exponential growth in the number of museums and the number of universities. We have also seen rapid growth in the number of university museums. Many were originally established to support the teaching of specific disciplines (Simpson 2012), particularly those with scholarly traditions based on observation, for example geology, botany and anthropology. The modern situation for collections in higher education had become largely one of disciplinary dependence. All universities, however, have a tripartite mission centred on teaching, research and engagement, and objects, collections and museums can play a fundamental role in each.

The other major trend in recent times that has accompanied the massification of higher education has been changes in the operating environment stemming from neoliberal government agendas forcing corporatizing and commercialising transformations. This trend has attracted much commentary. Through the adoption of business models, many universities have redefined themselves as retailers of knowledge-based products and services rather than platforms for the production and transmission of knowledge (Parker 2011). This has

had a major impact on the structural elements that comprise many higher education institutions. Faculties and departments are restructured, teaching and research resources reconceptualised into new organisational subunits, continual change and institutional churn has become the norm as universities grapple with the realities and challenges of a changing operating environment and significant reductions in public funding.

Over the last decades of the twentieth century and the opening decades of the twenty-first, as knowledge has become democratised and higher learning available to many, we have witnessed an exponential growth in the number of museums and the number of universities

Reconfiguring institutions as ‘knowledge retailers’ in a global marketplace has wrought many changes to course and study offerings. Study programs that have an instrumental utility or market value for the consumers of education are favoured at the expense of those that do not. In many instances, institution-wide single degree programs have been replaced by a plethora of named and specialised degrees as a way of branding their utility for the market place. Any area of intellectual endeavour, be it teaching or research, without marketplace cache withers on the vine. Many national higher education sectors have reported a significant recent decline in support for the humanities, as expressed by reducing staff and student numbers, as neoliberal government public sector settings inexorably do their ‘transformative’ work (Bonal 2003, Morley et al. 2014).

These changes have been so fundamental that it can possibly be argued that what was once at the margins of the university, applied knowledge through vocational specialisation in areas of economic utility, is now at the centre. Whereas, areas designed to explore the meaning and metaphysics of art, culture and nature, in other words, the humanities, that were once at the centre of the higher education enterprise, are now consigned to the margins, struggling to maintain a toehold and searching for claims of validity in an environment where modalities of quantification are increasingly seen as the only viable framework for measurement.

If value can only be ascribed to things that can be measured, what does this mean for the material collections of higher education (Simpson 2017), particularly with an existing history of disciplinary fragmentation and differing pedagogies and research methodologies? What it

means is a modern situation that is fairly complex and chaotic. The result is a system that is characterised by a diversity of outcomes stemming from idiosyncratic institutional, administrative and legislative responses. Universities increasingly combine collections, start new ones, deaccession or simply dump material collections in a desperate effort to realign collection assets and eke out some form of competitive advantage.

Epistemic convergence and existential crises

Climate change, biodiversity loss, increasing economic inequality, civil disorder, food security; there is no denying the magnitude of the threats that face the future of humankind. If universities have a role in helping societies to confront these, we must consider whether the history of knowledge production and disciplinary specialisation have placed impediments to resolving these manifold impending global existential crises. With everything connected in complex ways in a globalised world there are no easy answers to any of these big questions.

If we consider the three missions of higher education, and look on a micro-scale at a few examples where disciplinary silos are being creatively breached, perhaps there is evidence for the potential of a grander scale epistemic convergence that may give some hope in confronting these challenges. Objects provide multiple pathways to understanding and multi-disciplinary avenues for engagement with ideas. Is it possible to reclaim the metaphysical diversity that comprises the contextual envelope of objects and collections as a way of diversifying knowledge production rather than consigning some context to irrelevance?

Teaching, or the transmission of knowledge, as the first mission of universities, has seen a recent resurgence of interest in object-based learning (Simpson 2014b). There are many institutional level reports of new pedagogic uses of collections in cross-disciplinary teaching (e.g. Bartlett 2012). A recent project at Macquarie University (Sydney, Australia) demonstrated a wide range of new uses for objects in history collections that could be deployed in the teaching of medicine and health studies, psychology, law, environmental science and engineering (Thogersen et al. 2018). Objects and material collections in higher education provide many under-utilised

pathways for crossing disciplinary boundaries and can be applied to both individual and collaborative learning scenarios. Furthermore, the diversity of pedagogic application is broad, for example art collections in universities are finding new roles in honing observational skills in teaching medicine and science.

Objects and material collections in higher education provide many under-utilised pathways for crossing disciplinary boundaries and can be applied to both individual and collaborative learning scenarios

Research, or the generation of knowledge, as the second mission of universities, can be facilitated by the nature of collections as both the evidence and record of previous thinking. Series of specimens from the natural world can also therefore be historically important because, contextually, they capture culturally situated past research practices in both the sciences and the humanities. As they collectively constitute a comparative framework for understanding the world, collections can also act as a comparative framework for further investigations. Good collections can attract high calibre researchers who ask new questions and boost the academic profile of the host department and university (Simpson 2012). In this way, collections can link the past, present and future of research. But too many universities dispose of collections when there are minor changes in research priorities. The nature of research questions change as technology changes. For example, biological collections that once the source of productive taxonomic research can be rediscovered as useful databanks for molecular biological investigations (Simpson 2012). Science and technology also allow new research questions to be posed of cultural collections (MacKenzie-Clark & Magnessen 2016). As with the transmission of knowledge, the generation of knowledge is facilitated by the multi-disciplinary contexts of objects.

The third mission of the university, broadly defined as engagement with, and impact on, society, is another realm where objects and museum methodology can be harnessed by higher education. Two examples illustrate how this work is currently being undertaken. Firstly, at an institutional level, the University of Strasbourg's 'Jardin de Sciences' utilises its existing university collections for the third mission by transmitting institutional values on the importance of understanding science in a cultural and social framework (Boudia & Soubiran 2014). They argue that university museums play a vital role in

providing a bridge between academic staff and public groups. Museums bring an expertise in communication and interpretation of academic subjects to neutral spaces that break down the power divide between academic researchers and the public. A second example, the Science Gallery, originated as an exhibition space at University College Dublin and has now spun out into an international network of university franchises attracting significant philanthropic support. It was conceptualised as an experiment in public engagement with science and technology that brought science into dialogue with the arts through exhibitions, events and festivals allowing interactions and encounters between the public and scientists (Gorman 2009).

These examples show that it is clear that collections in higher education can act as a template for cross-disciplinary thinking while serving all three missions of the university. But if only local solutions, experiments and programs emerge to suit specific institutional aspirations, is it realistic to expect any globally significant changes of epistemic convergence to fundamentally breach disciplinary silos and allow constructive action in confronting the range of existential crises we face? Do any answers perhaps lie in the potential of the network?

Museums bring an expertise in communication and interpretation of academic subjects to neutral spaces that break down the power divide between academic researchers and the public

UMAC (University Museums and Collections) was conceived in 2000 by an international group of university museum professionals who realized that university museums face different issues because of their location as part of a larger higher education institution. UMAC was established as an international committee of ICOM (International Council of Museums) in 2001 to advocate for the creative use of material collections in higher education. The group was established because of a perception that higher education in many nations was not making best use of material collections under their auspices, in some cases simply discarding potentially useful material in response to a changing and increasingly challenging neoliberal operating environment. UMAC represents any area of human intellectual endeavour that is represented by material collections in higher education; all forms of art, science and culture. The establishment of UMAC was controversial in itself; some within ICOM argued that there no new interna-

tional committee should be established that cuts across existing disciplinary boundaries (Nykänen 2018). But the successful establishment of the group authenticates the broad and deeply historic relationship between objects and knowledge.

It also illustrates the difficulties in breaking down disciplinary silos and evoking any form of epistemic convergence. While collections of natural history specimens can tell us stories of past extinction events, ecological collapse and global climate change, these scientific disciplines in isolation cannot provide lessons in how humanity should confront these changes. We need to keep alive rational, imaginative, critical thinking about these urgent and fundamental questions in multiple cross-disciplinary frameworks. Objects and collections can facilitate this.

Maxwell (2014) argues for a new form of knowledge production called aim-oriented empiricism. He holds that untestable, metaphysical theses should form a permanent part of scientific knowledge rather than being discarded. He argues that this would transform academic enterprise and fundamentally reconfigure the natural and social sciences.

Maxwell's solution is to reinvent universities as seeking wisdom. Wisdom enquiry identifies local and global issues that need to be addressed, and in each case, wisdom is served by targeted knowledge enquiry. He argues that most academic disciplines would transform. Each discipline's aims, evidence and methods would be reshaped as a result of academic scrutiny and contestation through the inclusion rather than exclusion of broader metaphysical perspectives. He argues that the traditional Western view has favoured a narrow, cognitive and functional version of wisdom that has turned universities into agglomerations of specialised labs and professional schools.

This argument can be interpreted as a call for the proactive rediscovery and retention of multi-disciplinary frameworks as part of our knowledge systems in preference over narrow specialisms. UMAC contends that material collections, because of the intrinsic and extrinsic characteristics of objects, provide a template for this, while museums in universities provide a laboratory.

Humanity is in uncharted territory, never has the planet carried such a large population of humans, never has our physical environment been so challenged by human activity, never before has change been so rapid and

wildly unpredictable. In such an age of uncertainty, it would seem that the problems we face are so complex that no single person, institution or academic discipline will be able to solve them. Furthermore, as we transform into a single planetary-scale digital ecosystem of information; segmenting, fencing off and isolating data in formal disciplines would seem cognitively more and more incongruous and unproductive. Universities need to work collaboratively beyond their national borders and university academics need to work collaboratively beyond their disciplinary borders.

One way of encouraging epistemic convergence is clearly the creative use of material collections in higher education. They should be lifted from their discipline-specific origins to play a more dynamic and central role at university, one that focuses on major issues and big questions that can draw on the broad intellectual dynamics from diverse areas of the institution. While some good examples of this are already occurring (Simpson 2014b), much more could be done. This change in thinking and reorientation of institutional assets often needs to be driven by senior university leadership groups, or staff effectively advocating for this change to institutional leadership.

One way of encouraging epistemic convergence is clearly the creative use of material collections in higher education. They should be lifted from their discipline-specific origins to play a more dynamic and central role at university

We need to reconceptualise the modern university and university museum as humanist projects. They need to be founded on inclusion rather than exclusion, speciality and division. This will make it possible for university museums to not just be individual storehouses of the knowledge of humanity; instead they could be the wellsprings that inspire creative thinking about the future. The ability to leverage the past, to understand the present and to inform how we approach the future is the innate potential that can be derived from applying museum methods to collections.

UMAC as a global collegial association stands ready to engage in this with any higher education institution seeking to creatively use its material collections in shaping the future.

References

- Bartlett D. (2012). Coaxing them out of the box: Removing disciplinary barriers to collection use. In Jandl S, Gold M, editors. *A Handbook for Academic Museums: Exhibitions and Education*. Edinburgh & Boston: MuseumsEtc
- Bonal, X. (2003). The neoliberal educational agenda and the legitimisation crisis: old and new state strategies. *British Journal of Sociology of Education*, 24(2): 159-175.
- Boudia, S. & Soubiran, S. (2014) Are Social Sciences able to Revolutionize Mediation Practices in Science? In Haggag, M. & Gresché-Koning, N. (Eds.) Proceedings of the joint UMAC - CECA conference. Squaring the Circle? Research, Museum, Public: A Common Engagement Towards Effective Communication. ICOM UMAC & CECA Committees, p. 103.
- Boylan, P. J. (1999). Universities and Museums: Past, Present and Future, *Museum Management and Curatorship* 18: 43–56.
- Cohen, H. F. (1994). *The Scientific Revolution: A Historical Inquiry*. University of Chicago Press.
- Gorman, M. J. (2009). Experiments in the boundary zone: Science Gallery at Trinity College Dublin. *University Museums and Collections Journal* 2, pp. 7-13.
- Lasser, E. W. (Editor) (2017). *The Philosophy Chamber: Art and Science in Harvard's Teaching Cabinet, 1766-1820*. Yale University Press.
- McKenzie-Clark, J. & Magnussen, J. (2016). Real and virtual: The role of computed tomography and 3D imaging in museum practice in Simpson A. and Hammond G. (eds). *A Cultural Cacophony: Museum Perspectives and Projects*. Museums Galleries Australia. Canberra.
- MacGregor, A. (2001). The Ashmolean as a museum of natural history, 1683–1860. *Journal of the History of Collections*, 13(2), pp. 125–144.
- Maxwell, N. (2014). *How Universities Can Help Create a Wiser World: The Urgent Need for an Academic Revolution*. Imprint Academic, Exeter.
- Maxwell, N. (2018). *The Metaphysics of Science and Aim-Oriented Empiricism: A Revolution for Science and Philosophy*. Springer.
- Morley, L., Marginson, S. & Blackmore, J. (2014). Education and neoliberal globalisation. *British Journal of Sociology of Education*, 35(3): 457-468.
- Nykänen, P. (2018). First steps in global advocacy: some perspectives on the formation of UMAC, an international committee of ICOM. *University Museums and Collections Journal* 10, 10-21.
- Parker, L. (2011). University corporatisation: Driving redefinition. *Critical Perspectives on Accounting* 22, 434–450.
- Simpson, A. (2012). Modelling governance structures for university museums and collections. In Jandl, S. & Gold, M. (eds.), *A Handbook for Academic Museums: Beyond Exhibitions and Education*. MuseumsEtc, Edinburgh & Boston, 178–218.
- Simpson, A. (2014a). Why Universities Collect. In Macquarie University Museums and Collections curatorial team, editors. *Affinities: 7 Museums, 50 Objects* (Exhibition Catalogue). Macquarie University Art Gallery, Sydney.
- Simpson, A. (2014b). Rethinking university museums: Material collections and the changing world of higher education. *Museums Australia Magazine* 22(3): 18-22.
- Simpson, A. J. (2017). Beyond visitor statistics: value propositions and metrics for university museums and collections. *Museum Management and Curatorship*, 32(1), 20-39.
- Thogersen, J., Simpson, A., Hammond, G., Janiszewski, L., & Guerry, E. (2018). Creating curriculum connections: a university museum object-based learning project. *Education for Information*, 34(2), pp. 113-120.
- Thomas, N. (2016). *The Return of Curiosity, what museums are good for in the 21st century*. Reaktion Books London.

Mediating the Duality of Universities and Society: Arts and Humanities Confronting the Obstacles of ‘Authentic Engagement’

Richard Watermeyer

Abstract

In recent times discussion concerning the civic role of universities (Goddard et al. 2018) and their contribution to the public good (Marginson 2011) has been prominent. Considerations of societal relevance and responsibility intersect with and are amplified yet also confused by a pervasive feeling that universities as public organisations are in a state of profound transformational crisis, prompting some to question what they are for (Collini 2012). Such anxiety and ambivalence are habitually explained by and attributed to what Wendy Brown (2015) calls ‘neoliberalism’s stealth revolution’, and that via compliance with or be that capitulation to the competition demands of a global knowledge economy, universities have allowed – without being full cognisant – their societal contribution to become subjugated or otherwise controlled by capitalistic interests. Olssen and Peters (2005) have previously commented on how the neoliberalization of higher education has fomented a new form of governmentality and the manipulation and seduction of academics by ‘performative’ technologies of governance and rewards. These technologies have had and continue to negatively impact the conduct and behaviour of academics, where their public contributions have in real terms either weakened or been corrupted (Watermeyer 2012). And yet these aberrations are obscured or else exonerated by a popularized (and institutionally curated) image of universities as committed to a purposeful engagement with their public communities and the currency afforded to paradigms of knowledge production and governance that advocate knowledge synergies (Gibbons et al. 1994) and an explicitly instrumentalist (Leydesdorff and Etzkowitz 1996) and fiscal rationalisation of universities (Watermeyer and Olssen 2016).

Accordingly, there may well exist an abundance of ‘evidence’ that supports claims of academics and universities societal engagement and especially perhaps among those affiliated to arts and humanities disci-

plines who are intrinsically outward facing and whose need among the disciplines to claim public relevance is greatest if most difficult to achieve, especially in a milieu of continued economic precarity. Yet such ‘evidence’ is, as will be claimed herein, more the consequence of what Cris Shore (2008) calls ‘audit culture and illiberal governance’ or what Watermeyer (2019) terms ‘competitive accountability’ than academics as driven by a moral compass. The prospect for a more authentic and meaningful public interface is thus, as will be argued in this entry, constrained and arguably even denied by a chase among universities for positional gain and goods. In mediating the duality of universities and society and the potential of more meaningful concert, academics and their universities must commit to dismantling the delusions and dissonance caused by a system of ‘competitive accountability’ – observed so vividly in the UK’s Research Excellence Framework (REF) and other performance based funding systems – and the cognate urges of a ‘competition fetish’ (Naidoo 2016) that sets them and their publics apart.

Introduction

In recent times, discussion concerning the civic role of universities (Goddard et al. 2018) and their contribution to the public good (Marginson 2011) has been prominent. Considerations of societal relevance and responsibility intersect with and are amplified yet also confused by a pervasive feeling that universities as public organisations are in a state of profound transformational crisis – that also reflects much of what is seen to have gone wrong in contemporary society – prompting some to question what they are for (Collini 2012). Such anxiety and ambivalence are habitually explained by and attributed to what Brown (2015) calls ‘neoliberalism’s stealth revolution’, and that via compliance with or be that capitulation to the competition demands of a global knowledge economy, universities have allowed

– without being fully cognisant – their societal contribution to become subjugated or otherwise controlled by capitalistic interests (Giroux and Searls Giroux 2004). Olssen and Peters (2005) have previously commented on how the neoliberalization of higher education has engendered a new form of governmentality and the manipulation and seduction of academics by performative technologies of governance and rewards. These technologies negatively impact the conduct and behaviour of academics, where their public contributions have in real terms either weakened or been corrupted (Watermeyer 2012). And yet, these aberrations are obscured or else exonerated by a popularized (and institutionally curated) image of universities as committed to a purposeful engagement with their public communities and the currency afforded to paradigms of knowledge production and governance that advocate knowledge synergies (Gibbons et al. 1994) and an explicitly instrumentalist (Leydesdorff and Etzkowitz 1996) and fiscal rationalisation of universities (Watermeyer and Olssen 2016).

Accordingly, there may well exist an abundance of alleged ‘evidence’ that supports claims of academics and universities societal engagement and especially perhaps among those affiliated to arts and humanities disciplines who are intrinsically outward facing and whose need among the disciplines to claim public relevance (Benneworth, Gulbrandsen and Hazelkorn 2016) is greatest if most difficult to achieve; especially in a milieu of continued economic precarity. Yet such ‘evidence’ is more the consequence of what Shore (2008) calls ‘audit culture and illiberal governance’ or what Watermeyer (2019) terms ‘competitive accountability’ and the product of systematic manipulation rather than a spontaneous – and no doubt inchoate – wellspring of academics’ civic responsibility. The prospect for a more ‘authentic’ and meaningful public interface is thus constrained and arguably even denied by a chase among universities for positional gain and goods. In mediating the duality of universities and society and the potential of more meaningful concert, academics and their universities must commit to dismantling the delusions and dissonance caused by a system of competitive accountability – observed so vividly in the UK’s Research Excellence Framework (REF) and other performance-based funding systems – and the cognate urges of a ‘competition fetish’ (Naidoo 2016) that sets them and their publics apart.

In mediating the duality of universities and society and the potential of more meaningful concert, academics and their universities must commit to dismantling the delusions and dissonance caused by a system of competitive accountability

So much of academics’ public interface, in the milieu of higher education as an ‘audit society’ (Power 1997) seems motivated by reasons other than moral obligation or ethical code and their commitment to the public good may be as ephemeral and inconsistent as educational policy is capricious. Their engagement may be motivated by the impulse of competitive accountability and the cognate urges of self-interest, careerism and the kinds of individualistic rewards won via the commodification of an ethics of scientific openness and transparency. Consequently, their *public engagement* may be engineered, if covertly, for the purpose of promoting individual (and institutional) scholarly ‘distinction’ (Bourdieu 2010, see also Watermeyer and Chubb 2018) and thus used as a vehicle of competitive advantage in outperforming their peers and (institutional) rivals within the market melee of entrepreneurial excellence⁽¹⁾. However, the contribution of public engagement as a positional good – for both individuals and institutions – is despite significant investment in its image-cultivation – fiercely contested, certainly where it is unconnected to research (Watermeyer and Lewis 2015). Even the value of ‘engaged research’ is problematic; complicated by a myriad of associated and diverging meanings and forms of practice, and significant variation in the manner of its institutional prioritising and resourcing. Furthermore, while there are some disciplines that would claim their research to be nothing without the engagement and involvement of public communities, other disciplines may be more hermetic and unconvinced of the merits (and status) of public engagement⁽²⁾ as an academic endeavour. Ostensibly, the latter is less true for those in arts and humanities disciplines who, like their counterparts in the social sciences, rely upon ‘the public’ often as knowledge partners or at least turning-keys in the machinery of their knowledge production. However, it would be mistaken to assume that *all* academics working in such disciplines are inherently disposed to public interaction. In fact, for many members

1. I have encountered many academics in the UK, committed to public engagement, who describe it as ‘CV fodder’ and a means to further elevate and distinguish their achievements and thus employability.

2. Even where public engagement is shown to enhance the research process or the reputation of researchers.

of the humanities, a proclivity for, if not indulgence of theoretical abstraction and esotericism, has made opaque even unidentifiable the utility, application and salience of their intellectual endeavours (cf. Said 2002)⁽³⁾. In such terms, academics may be guilty of becoming unknown to their publics and potentially unknown to themselves where bereft of the impetus for reflexive praxis. Public engagement thus provides a route to (re)discovering and potentially recovering a sense of being and belonging, or in other words, *identity*.

Identity

As I write, from the vantage of the UK, the failures of capitalism have never appeared so pronounced, never so obvious, and perhaps nevermore so reflected and manifestly observed in the organisational incoherence, ontological splintering, and epistemic frailty of universities as neoliberalized organisations – and their apparent incapacity to self-mend and consequently fulfil many of their (non-capitalistic) public obligations. The erosion of, not so much their commitment but *capacity* to service the public good – and the subsequent urge to compensate for such deficiency by way of what are habitually fictionalised though widely broadcast ‘licensed’⁽⁴⁾ assertions of their public mission (to both staff and stakeholders) – is linked to the seductions of the market and the fascination and enthusiasm of their leaders in playing a market game (cf. Lucas 2006). Thus, the unloosening of universities’ *noblesse oblige* may be attributed to their naivety, vulnerability and limited resilience in response to the vagaries of the market, and by extension the reflex of self-survival in prioritising economic concerns; and not just as may be supposed, casual or egocentric abdication of public engagement as a moral duty. Yet the role and reciprocity of the university in providing public leadership and pathway through what is currently a historical period of profound societal disagreement and polarisation is nevermore so necessary yet under-invested and woefully resourced (Watermeyer and Lewis 2017; Watermeyer, Rowe and Shields *forthcoming*). Accord-

ingly, an institutional rationalisation for investing in public engagement, and support for those, perhaps most especially in arts and humanities disciplines – and I would add, the social sciences – must be met on the basis of attending to what must now surely be one of the most pressing and universal of societal challenges.

Universities must show leadership in response to what Fukuyama (2018) characterises as a crisis of public identity and in helping to mediate and perhaps even resolve problems of social estrangement, unbelonging and lost dignity, aggravated and escalated by a system of capitalism unchecked – which resulted in the global catastrophe of 2008 and subsequent social devastations of a politics of austerity. Universities and their intellectual communities are integral to leadership out of an identity *cul-de-sac*, so immediately observable in the national contexts of the United Kingdom and United States and the proliferation of ideologues and populists as peddlers and profiteers of victimization and societal fracture. The contribution of universities to the public good might then be to what Collier (2018) contemplates as a principle of ‘ethical capitalism’ predicated upon ‘reciprocal obligations’. In such a way, public engagement by universities might be considered less a ‘good’ or ‘aspirational’ thing and instead an ordinary if integral part of what academics do.

In the current era of geo/socio-political turmoil, universities investment in public engagement would seem undeniably important, not least where their populations appear antagonistic to public opinion or consensus. Take for example the case in the UK of the academic community being resonantly opposed to Brexit, yet universities in some instances being located in Brexit strongholds. The need for dialogue between two such communities is obvious and not just for the maintenance of neighbourly relations. Dialogue will certainly help mitigate community tensions but also serve to interrupt the proliferation of populism that has emerged as a consequence of social cleft between groups of the same locality (who at least once shared a temporally defined affiliation and, therefore, sense of belonging). Such cleft is described by Collier (*ibid*) as the product of advanced capitalism and the separation of communities through the evolution of labour-based demands and educationally facilitated specialisation, and thus, the elevation of an (university) educated middle-class elite with the simultaneous disenfranchisement of a low(er) skilled un(der)educated working class.

3. Here we find parallels with the alleged retreat - even disappearance of - the public intellectual and, concurrently, the weakening or obfuscation among researchers of an intellectual project and correspondingly an intellectual inheritance.

4. By ‘licensed’ I mean officially sanctioned broadcasts found in institutional marketing materials and formal internal value-based communications such as relate to performance review and/or promotion.

Dialogue then may enable common-ground, or the folding in of multiple perspectives in the democratic search for enlightened, representative and inclusive solutions. Here may be found strong parallels with early ideas and motivations for the public understanding of science, which was viewed as a means of diffusing public anxiety and mistrust in the context of scientific complexity and controversy. However, in the sphere of the arts and humanities, public engagement may be more than just an instrument of risk management. It may instead be deployed for the purpose of social actualization— a means of locating through an array of communication technologies the social contract: peoples' values, needs, wants and injustices. It may be a means through which reciprocal obligations are identified, agreed upon and met. It may be about making and restoring community – through shared image, word and sound. It may be about the convergence of what may be theoretically sophisticated and/or evidentially tested knowledge with the knowledge borne of lived experience. It may be a purposeful and necessary coming together, motivated more by pragmatism than altruism. It may be about the generation of democratic identities.

The promise of public engagement, therefore, greatly exceeds a typically paternalistic 'town and gown' relationship and the awkward coalescing of two different communities in choreographed or feigned harmony. Such a premise is horribly reductionist and contrived and assumes an eternally deficit public. More profitably we might think of public engagement as the creation of an explicitly porous, heterogenous, freely and openly critical community.

As cultural institutions, social spaces, employers, educators, and what Giroux (2002: 456) calls 'a vital public sphere for critical learning, ethical deliberation, and civic engagement', universities are core to the incubation – and as would befit the motif of contemporary times, the restitution – of (lost) identity. They are also conversely factories of privilege and power and symbols of elitism, inequality and social domination, distinctly off limits and/or off-putting to many public communities⁽⁵⁾. The role of the public to the realisation of the university as a public space is in such terms all the more integral and as Kennedy (2015: 130) has observed, 'prominent

in the re-articulation of higher education'. Students of course, as has been so forcefully evidenced in the UK, have been core to contesting the university's neoliberal transformation and the damage wrought by intensive marketisation. So too have politicians, public leaders, parents and pundits.

But the privilege and power of universities as collectives of highly intelligent and on occasion virtuous actors, may also be co-opted for transformational gains. They are fertile with and consequently foment an insurgent politics with many academics as neoliberal agitators working to actualize and empower (themselves and other) invisible and 'counterpublics' (Warner 2002) against forms of social injustice committed both within and outside their institutions. Such may be observed of academic and student involvement and leadership in the UK, in the contexts of the Occupy movement, vice-chancellors' pay scandal, and pensions strike (cf. Watermeyer 2019). In all of these examples, we find the contribution of academics as 'public' intellectuals, wilfully engaged in a theatre of protest and carnivalesque, while placing themselves at real risk of institutional censure or exclusion. Through performance, poetry, art and music, academics (and artisans) have been seen to commit to creative and critical pedagogies – and authentic reflexive praxis – in both offline and online realms, that articulate and advocate counter-discourses and alternative realities that unsettle the grip of hegemonic power, and expose the egregiousness of corporate excesses that have invaded public institutions. Unsurprisingly, some among the managerialist elite seek to quell and/or quarantine the energy of non-conformism so as to preserve their own authority and protect the exploitability of the university as a capital investment. Their obstruction to the potential of academics as critically agentic and therefore potentially deleterious to the interests of the neoliberal university is varied and pronounced but not as has already been shown, unopposed or without hope of evasion or dismantling.

Through performance, poetry, art and music, academics (and artisans) have been seen to commit to creative and critical pedagogies – and authentic reflexive praxis – in both offline and online realms, that articulate and advocate counter-discourses and alternative realities

5. Universities as illustrative of the consummate efficiency of neoliberalism in the desecration of democratic values become symbolically significant in the fight for the reassertion of democratic values.

Obstacles

In the course of the last ten years my research has led me to many academics committed to a public interface that have and continue to find their external interactions compromised by a multitude of institutional obstacles and prejudices and subject to professional cost. The extent to which universities support academics' public engagement endeavours is weak, and potentially especially so among arts and humanities researchers, whose positional gain from engagement may be either small or difficult to measure. So much of what is prioritised in universities is that which is amenable to measurement and complementary to the criteria of performance evaluation (Peseta et al. 2019). By way of example, in the UK's REF, public engagement is considered to be not the materialisation but mobilisation of impact. In other words, engagement is relevant to making impact but does not count as impact itself. For many disciplines, and many arts and humanities subfields, this distinction may be especially challenging, with researchers restricted by the 'boundedness' of their discipline and therefore contained to types of public interface that are devoid of measurable impacts. And so, where an ability to evidence impact from research in the REF not only returns significant tranches of government funding to universities but feeds their claims of excellence and rankings in performance league tables, to do engagement must be to generate impact, and where not, the institutional guidance would seem to be, abort or abandon for that, and *only* that, which yields impact. As such the freedom, open-mindedness and generosity of academics' public interface dwindles; confounded by the primacy of market logic that privileges not what may be given but gained. Where public engagement is delimited to the generation of impact, the consequence may be that many kinds of public interactions will fall by the wayside and so too will many public communities – disownment for all but those able to lubricate the wheels of an impact production-line.

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The institutionalization of public engagement, fancied by some as a culture-change panacea, will also no more facilitate the quantity and quality of academics' public interface than restrict it to a corporatized and financially proscribed template. Moreover, the social problems of institutionalization are rife, where public engagement within universities suffers from both major gender and career-stage imbalances, with a vast majority of academics (and professional service staff supporting) public engagement being female and/or early career, and, therefore, at heightened risk of paternalistic bias and exploitation from higher education leadership. The implications of all of this for public engagement with arts and humanities disciplines are perhaps most troublesome, where alignment and complementarity with impact and, specifically the demands of impact evaluation are less than optimum. What may transpire is not quite a moratorium on engagement by arts and humanities researchers but, in the absence of more tangible and more easily evidenced impacts, an issue of weakened status and salience. The obvious corollary to this is an escalating need among researchers to seek the reassurance of efficacy granted by institutional recognition and reward, while at the same time sidestepping the contaminating effects of public engagement where perceived as a negative indicator of academic excellence.

Consequently, by no small measure of surprise, we find that public engagement remains a marginalised activity, committed to mainly either by opportunists able to engineer and extract from it impact value or otherwise those whose moral conviction and sense of civic duty exceeds the pitfalls of vanity and hubris and dampens the arrestive effects of occupational precarity. A general apathy or otherwise avoidance for public engagement, especially at institutional and senior-managerial levels, has despite significant financial investment in culture-change, remained largely unaltered and unchallenged. A progressive and perhaps, proactive culture for public engagement is far from embedded. Moreover, a wholesale conversion to the merits of public engagement – or even consensus on the efficacy of public engagement as an academic undertaking – will likely remain, for as long as its contribution to universities playing a market game remains feeble. Accordingly, we will likely see its continued patchiness across universities in the terms of uneven leadership and scant resourcing. For as long as a marketized model of higher education persists, we may also see an academic investment in public engagement being made mainly

on the terms of personal profit and what individuals get out from what they put in. Indeed, we might argue that for as long as public engagement requires incentivising – by way for instance of institutional rewards and recognition – then academics will remain wedded to the maxims of *homo economicus* and perpetually adrift from more pro-social behaviours captured in an ideal of the ‘moral economy’ (Bowles 2016).

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Yet institutional support for public engagement is notoriously weak and trapped by the instrumentalist binds of competitive accountability. Academics in arts and humanities disciplines, especially therefore need qualities of bravery, fortitude and self-sacrifice in transgressing the jurisdiction of their otherwise disinterested, performance fixated institutions. Their being within their public communities should be something unrestricted by the performance demands⁽⁶⁾ of institutional masters. Academics’ public engagement needs to escape the penumbra of the institutional watchtower. Yet this is easily said and yet far less easily achieved – especially for those already at risk. As much as public engagement demands a reciprocal obligation between academics and their public communities – the sustainability of the so-called ‘science and society’ nexus requires a reciprocal obligation between universities and their academics.

Mutual reciprocity

Institutional reciprocity in this case, however, suffers from a potentially irresolvable dichotomy. To incentivize academics’ engagement in the public sphere (through recognition and reward) is to potentially nurture disingenuous and what will likely be reductionist, sanitized and apolitical versions of engagement that lead to measurable outcomes-come-impacts. It may result in the wrong kinds of people undertaking engagement (with the wrong kinds of public?) for the wrong kinds

of reason, and potentially even with the wrong kinds of outcomes. Advocating instead the humility and uncertainty of public engagement may be key to dislodging the triumphalism and dogma of impact and securing the freedom from which to fashion stories that reconstruct the public sphere. However, in higher education’s prestige, hyper-competitive and precarious labour-market, a capacity for returning positional goods of the impact kind is paramount to academics’ career sustainability and progression and thus is difficult to dismiss out of hand, no matter how much it is used to justify inaction.

It is instead perhaps more profitable to consider public engagement in the context of an obligation of *mutual reciprocity*. Mutual reciprocity would see universities and their academic constituents interfacing with public communities, not as predicated or controlled by some predetermined (and evaluative) end or as hierarchically regulated but on the basis of joint intervention – a kind of critical solidarity. The public interface would be mobilised and rationalised on the terms of engagement nurturing academics’ political agency while empowering citizens as critical activists – academics and public citizens synergised in holding power to account. Mutual reciprocity would thus foment a fight-back against the apoliticization of universities and their deterioration into political hinterlands and ‘safe spaces’ (Slater 2016), while simultaneously providing for the public appropriation of the university as a genuinely democratic institution. We might think of this as the publics’ reclaiming of the university as their own. Of course, this can and is achieved through the universities’ pedagogic mission and there is growing evidence of how the innovation of formal curriculum in connecting with civil society is enhancing and emboldening students’ critical citizenship and challenging the primacy of higher education as an economic enabler – even if widening participation and equality policy initiatives fail to make much of a dent. The intervention of the public into the life of the university, and not only as learners, but as architects and activists, is thus crucial to protesting, arresting and potentially reversing the decline of universities into explicitly non-public, anti-democratic and corporate entities. It is also indispensable to the work of arts and humanities researchers in resisting “the Darwinian values of an unbridled capitalism” (Giroux 2002: 457) and locating alternative narratives – the substance of their craft – of public life. Public engagement, conceived of and approached as an intrinsically political act may in such terms be recast from a process fasten-

6. In fact, public engagement may appease the performance demands of senior managers where facilitative to other aspects of the academic portfolio.

ing academics to the corporate values of competitive accountability to a catalyst for economic decolonisation; collective resistance; creative emancipation; and a pathway to reconstructing not only the university but the public sphere as a democratic space. This vision, not of impact, is one of 'authentic engagement' and a means to seeing past the social disconnectedness and atrophy born of economic imperialism towards a more equal, fairer, just and progressive identity, and crucially an identity not of us and them, but 'we'.

Mutual reciprocity would see universities and their academic constituents interfacing with public communities, not as predicated or controlled by some predetermined (and evaluative) end or as hierarchically regulated but on the basis of joint intervention – a kind of critical solidarity

In mediating the duality of universities and society, public engagement must be decoupled from impact, performativity and profit; must be embraced as an inherently political (but not politicised) act and act of political renewal that is unavoidably risk-laden; must escape the binds of institutionalization and the agentic poverty of precarity; must be selflessly committed to the espousal of new narratives of self, and new declarations of identity that transcend the neoliberal stalemate and that overturn the fraudulence of competitive accountability, for which the arts and humanities are so well placed and so necessarily a part of. Moreover, the future of the public university depends on the succession of a language of *public engagement*, which has become (as a policy artefact) stale and stuck, antithetical to an original 'upstream' vision, and wholly inadequate. In its place, a discourse of *public activism* should provide a more potent and profitable (and policy detached) pathway to conceptualising and mobilising mutual reciprocity and the elicitation of more democratically progressive narratives of the social world. Co-opting and inverting the power and privilege of higher education to empower the invisible publics of marginalised and disenfranchised communities – those in greatest need of rescue from the failures of capitalism – is key both to the future welfare of the public sphere and justifying the contribution of the public university. But in achieving this, academics need to operate as 'boundary spanners' within the productive margins of higher education. An unshackling of academics from the material restrictions and anxieties of their institutions and a move almost towards a post-institutionalism will

foster a deep and dynamic interchange of ideas and knowledge – so often now analogous to the perceived freedoms of the digital public sphere⁽⁷⁾ - unfettered by the trappings of space and place and organisational rules and regulations. This is not culture-change but perhaps, in the spirit of necessary adventure, the beginnings of a brand-new paradigm.

Recommendations

Public engagement as a catalyst of democratic participation – and scientific democratisation – requires that its protagonists accept and embrace its potency as an instrument of political renewal. This is an obligation as much for academics as all higher education stakeholders.

Accordingly, public engagement requires an ideological reinvestment in the terms of mutual reciprocity and via the co-option of 'public' constituencies as invested contributors within a 'science and society' nexus. And crucially a nexus freed from the reductiveness and associated social devastations of economic imperialism.

Thus, public engagement should be untethered from the binds of its institutional rationalisation which weakens the capacity and potential of academics as agents of the public good. This begins with a progressive and radical reimagining of public engagement that disavows and resits the compulsions of competitive accountability and conversely elevates (and rewards) academics' *public activism*. While the arts and humanities are central to this creative and for some, controversial work, this is a burden of shared responsibility with benefits not to the few but many.

References

- Benneworth, P., Gulbrandsen, M. and Hazelkorn, E. (2016) *The impact and future of arts and humanities research*. London: Palgrave Macmillan.
- Bourdieu, P. (2010). *Distinction. A Social Critique of the Judgement of Taste* [[en cursiva]]. Routledge.
- Bowles, S. (2016) *The moral economy: Why good incentives are no substitute for good citizens*. New Haven and London: Yale University Press.

7. And what I have called elsewhere as 'peripheral zones of (non) participation' – see Watermeyer (2019).

- Brown, W. 2015. *Undoing the Demos: Neoliberalism's stealth revolution*. New York: Zone Books.
- Collier, P. (2018) *The future of capitalism: Facing the new anxieties*. Allen Lane/Penguin.
- Collini, S. (2012) *What are universities for?* London: Penguin.
- Fukuyama, F. (2018) *Identity: Contemporary identity politics and the struggle for recognition*. London: Profile Books.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary society*. London: Thousand Oaks, New Delhi: Sage.
- Giroux, H. (2002) Neoliberalism, corporate culture and the promise of higher education: The university as a democratic public sphere. *Harvard Educational Review*, 72(4), pp. 425-462.
- Giroux, H. and Searls Giroux, S. (2004) *Take back higher education: Race, youth and the crisis of democracy in the post-civil rights era*. New York: Palgrave Macmillan.
- Goddard, J., Hazelkorn, E., Kempton, L. and Vallance, P. (eds.) (2016) *The civic university: The policy and leadership challenges*. Cheltenham: Edward Elgar
- Kennedy, M. (2015) *Globalizing knowledge: Intellectuals, universities and publics in transformation*. Stanford, CA: Stanford University Press.
- Leydesdorff, L. and Etzkowitz, H. (1996) Emergence of a triple-helix of university-industry-government relations. *Science and Public Policy*, 23(5), pp. 279-286.
- Lucas, L. (2006) *The research game in academic life*. London: Routledge/Society for Research into Higher Education.
- Marginson, S. (2011). Higher Education and Public Good. *Higher Education Quarterly* [[[EN CURSIVA]]]. Vol 65:4, pp. 411-433. doi: <https://doi.org/10.1111/j.1468-2273.2011.00496.x>
- Naidoo, R. (2016) The competition fetish in higher education: Varieties, animators and consequences. *British Journal of Sociology of Education*, 37(1), pp. 1-10.
- Olssen, M. and Peters, M.A. (2005) Neoliberalism, higher education and the knowledge economy: From the free market to knowledge capitalism. *Journal of Education Policy*, 20, pp. 313-345.
- Peseta, T., Barrie, S. and McLean, J. (eds.) (2019) *Academic life in the measured university: Pleasures, paradoxes and politics*. London: Routledge.
- Power, M. (1997) *The audit society: Rituals of verification*. Oxford: Oxford University Press.
- Said, E. (2002) The public role of writers and intellectuals in H. Small (ed.) *The public intellectual*. Oxford: Blackwell.
- Shore, C. (2008) Audit culture and illiberal governance: University and the politics of accountability. *Anthropological Theory*, 8(3), pp. 278-298.
- Slater, T. (ed.) (2016) *Unsafe space: The crisis of free speech on campus*. London: Palgrave Macmillan.
- Warner, M. (2002) *Public and counterpublics*. New York: Zone Books.
- Watermeyer, R. (2019) *Competitive accountability in academic life: The struggle for social impact and public legitimacy*. Cheltenham: Edward Elgar.
- Watermeyer, R. and Chubb, J. (2018) Evaluating 'impact' in the UK's Research Excellence Framework (REF): Liminality, looseness and new modalities of scholarly distinction. *Studies in Higher Education*. Doi: 10.1080/03075079.2018.1455082
- Watermeyer, R. and Lewis, J. (2017) Institutionalizing public engagement through research in UK universities: perceptions, predictions and paradoxes concerning the state of the art. *Studies in Higher Education* <http://dx.doi.org/10.1080/03075079.2016.1272566>
- Watermeyer, R., Rowe, G. and Shields, R. *Leadership for public engagement*. London: Palgrave Pivot. (forthcoming)
- Watermeyer, R. and Olssen, M. (2016) 'Excellence' and Exclusion. The individual costs of institutional competitiveness. *Minerva*, 54(2), pp. 201-218.

University Culture as Communities of Practice: Cultivating Interactions Inside and Outside Campus

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Abstract

Campus life is busy. Academics, staff, and students usually have little time to spare besides study, research and the administrative duties involved in those two main activities. And yet universities have traditionally had a third mission: the extension of university culture, a complex phenomenon that can be seen at least in the role played by universities in knowledge transfer, lifelong education, social leadership and cultural innovation, as well as the protection and democratization of cultural heritage (Ariño 2019). Those dimensions are all intertwined in the social commitment of universities, which goes beyond the mere delivery of cultural services to the community. In this paper, university culture is understood from a relational point of view, as an ecosystem of relationships or interactions between academic and social agents, on and off campus. Based on recent experiences at the University of the Basque Country, some good practices at the local level are described, in the hope that they can help other academic and social agents to realize together the third mission of higher education. More precisely, the concept of “communities of practice” will be used to explain their contribution to university culture.

Communities of practice and how they can be used for university culture

Since it was introduced by Lave and Wenger (1991), the concept of Communities of Practice (CoPs), understood as a type of informal learning organization, has been extensively used in the education and business sectors. In general, CoPs are groups of people who care about the same real-life problems or hot topics, and who interact regularly to learn together and from each other. Following Pyrko et al. (2017), we view CoPs (and the knowledge they afford) more as a process than an entity that can simply be “set up” in a given environment.

Communities of Practice (CoPs) are groups of people who care about the same real-life problems or hot topics, and who interact regularly to learn together and from each other

A systematic review of the literature about CoPs in the health and business sector (Li et al. 2009) highlights several key features of existing CoP groups: their members interact with each other; collaborate to share and create knowledge; and foster the development of a shared identity among them. The emphasis on interaction between agents in formal and informal settings, and on the personal character of the identities and knowledge that emerge from it, suggests that the CoP concept might be useful to understand the processes involved in university culture.

Casado and Rodriguez (2019: 17-18) conclude that university culture is made up of interactions and relationships that require a material infrastructure of human, technological and economic resources. In order to contribute to a more equitable and sustainable society, universities need to reach audiences outside the classroom, while at the same time bringing the classroom closer to the workplace. The idea behind several dual-track study courses all over Europe is for students to obtain a degree while gaining practical insights into professional employment. Universities may embed their programs in professional and amateur networks, feeding them and being fed by them in return. But this should happen while at the same time protecting university culture and the sense of belonging to an academic institution, which is now at risk, eroded by new work conditions in the education and culture sectors. In today's accelerated cognitive capitalism it is increasingly harder to feel positive about belonging to one's institution, company or project, since “no one knows who they are working for.” To face this challenge, CoPs show the way to promote mutual engagement between co-workers and a sense of shared identity and purpose, fostering knowledge alliances between “the

best of both worlds”, science and the humanities: a combination of scientific skepticism and moral trust, so to speak (Garcés 2017: 63; 75).

Universities need to reach audiences outside the classroom, while at the same time bringing the classroom closer to the workplace

Findings: some good practices

The University of the Basque Country has about 45,000 students distributed across three campuses in a relatively prosperous region stretching along the Atlantic coast of northern Spain. Since 2017, there has been an ongoing action-research process on the Gipuzkoa campus regarding the dual responsibilities of universities in addressing both local and global demands concerning their integration in the cultural and economic systems, and their own mission and values such as autonomy or academic freedom. The main activities were a World Café organized in 2018, followed by a Summer School on the topic of university culture that took place in Donostia - San Sebastián, and then a collective book was published (Casado ed. 2019). The following three experiences are in part the result of this action-research process.

1. Making time to celebrate university cultures

Participants in the action-research often complained that campus life is so demanding and “atomized” that there is hardly any time to engage in activities other than study/teaching or research. Students have the feeling that there is no “free time” for them to spend on campus, and they tend to go back home as soon as lectures are over. Academics and staff are stressed by the daily demands of a competitive and sometimes precarious job. That is why it is especially important to save the date once in a while to meet with colleagues and friends who share similar interests.

Cultural events at universities are often celebratory in nature, serving as milestones in the academic calendar and helping to emphasize the features of the academic ethos that are considered relevant to our daily lives and

to society as a whole. On the Gipuzkoa campus, as on others, one of those milestones is the Science Week⁽¹⁾, which is organized every year around November 10th, the World Science Day for Peace and Development instituted by UNESCO to highlight the need to engage the wider public in debates on emerging scientific issues.

Science Week is celebrated on other campuses and by other institutions, but on the Gipuzkoa campus a few other “special times” are organized throughout the academic year. In order to encourage participation, the topics to be highlighted are highly cross-cutting and common to several disciplines. One of those topics is “critical thinking” and its main activity is Pentsatu (“to think”, in Basque), a three-day Festival of Ideas that is held on and off campus just after Science Week, beginning with World Philosophy Day as instituted by UNESCO on the third Thursday of November. There are events organized for and by the academic community, but a whole morning is devoted to inviting high school students to visit the campus, and on Saturday all activities take place in the city centre, aiming to engage the general public.

Science and Critical Thinking are indeed the main protagonists of the Autumn term, but in the Spring term there is a shift towards Literature, Music and Languages. Performances and concerts are the usual medium, but on the Gipuzkoa campus a new formula has been tried with some success: the thematic Open Mic night. First a theme is selected, normally with the help of an “ally”: a group or CoP interested in a particular theme, genre, language, or artistic discipline they want to practice and make more visible on campus. An example could be the community of people interested in learning French on campus, or the community of fantasy and science fiction readers and writers, the community of fans and practitioners of Basque improvised poetry (Bertsolaritza), the community of international students, etc. Then a date, a venue and a program are jointly decided by the CoP and the campus authority, and the university provides economic and technical support to run it, including payment to invited artists and an “after party” social time with drinks and something to eat. The CoP is responsible for publicizing the event using social networks and for most of its thematic content, since the participants in the Open Mic take turns to share with others the texts, songs, etc. that they have selected or prepared for the occasion.

1. <http://zientzia-astea.org/es/>

2. Granting autonomy to culture makers

Another insight provided by the action-research is that cultural events cannot be organized from a top-down approach. One of the reasons is that there is no single university culture, but many coexisting on the same campus.

At the end of the day, culture is made by those who live it, and all university managers can and should encourage and facilitate that. Identifying and sustaining CoPs is a step in that direction, but we are not talking about something at all new. The traditional model of student societies is still in good shape; for example, Oxford University has more than 150 officially recognized societies listed in its Register of Student Clubs.

On the Gipuzkoa campus there is a strong theatre community, with at least 10 years of continuous activity and 20-30 members. However, the action-research helped identify a problem: the Artistic Director of the theatre group was appointed by the campus authority, and that was decisive in the group's orientation and activity. In 2018 and 2019, steps were made to create a cultural association⁽²⁾, whose main goal would be to promote and organize dramatic and performing arts activities on campus, thus taking over the role of the previous Artistic Director. The campus authorities take no part in the doings of the society, which is autonomously run by its fee-paying members, most of which are university lecturers and students.

3. Opening spaces for creativity and change

Another problem identified in the course of the action-research was related to university extension courses, another fixture of academic culture all over Europe. Again, because of the inertia generated by campus dynamics, in which things tend to be repeated if they are successful enough, those courses (which on the Gipuzkoa campus are open to everyone interested, not only to the university community) tended to attract the same group of students and teachers, year after year. The situation was not in line with some governance principles to which public universities are obliged, nor with a spirit of radical experimentation and openness

to new ideas, since the purpose of university culture is also to sustain spaces for social and personal change⁽³⁾.

After consultation with experts and stakeholders, two criteria were agreed upon, and sanctioned by the Campus Council in 2019: (1) no teacher will be in charge of a given course for more than 2 consecutive years, thus maximizing the variety of topics and approaches covered by university extension; (2) all courses will include a practical dimension in which the group will have to produce some form of creative output that could potentially be shared with the campus community (for instance, a picture gallery, a poetry reading, a dance show, etc.); if necessary, campus authorities should provide the means to make it possible and available to the whole community.

Discussion and recommendations

The three preceding experiences share a common insight: university culture is not to be generated either from a top-down approach (culture by the elite) or a bottom-up one (culture by popular demand), but rather by interaction between university agents. In this new paradigm, which is experiential and interdependent on the context, culture is made by surprise and in action: "Learning is not just a matter of textbook and frontal learning (reading journals, following courses etc.). Practitioners start to learn when confronted with anomalies in their practice, when their routines and habitual ways of thinking are challenged. They learn through reflection in and on action. Learning in and from practice is integrated in action and not just cognitive but, first of all, experiential and context-bound. It is learning while doing." (Abma et al. 2010: 244)

Fostering informal learning by means of CoP not only becomes a new form of university extension, but also of experimenting with social innovation. University culture then not only becomes a form of university outreach, a sort of knowledge transfer (or "business card") from the university towards the rest of society; it is also a tool for the university to understand itself, thus fostering its identity and inner cohesion. For that to happen, CoPs cannot be created from the top-down, but they can be sustained, and there is ample literature identifying and describing the factors that cause them to thrive or col-

2. <https://www.ehu.es/es/web/gipuzkoa/eszenagunea>

3. <https://www.ehu.es/es/web/gipuzkoa/kritikagunea>

lapse. Those factors should be taken into account when deciding how campus life is to be organized, both in time (academic calendar, opening and closing times, etc.) and space (architecture and accessibility). Timetables, campus facilities and services should make it easy to meet with colleagues and, more generally, “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger, McDermott & Snyder 2002: 9).

University culture is not to be generated either from a top-down approach (culture by the elite) or a bottom-up one (culture by popular demand), but rather by interaction between university agents

We all want a vibrant campus life. But the elusive quality we call “aliveness” cannot be designed by a university manager, at least not in the traditional sense of specifying a structure or process and then implementing it. This does not mean that aliveness happens randomly, or that all campuses are equally lively. As Wenger et al. suggest, there are some principles that embody our understanding of what makes CoP work: “Many natural communities never grow beyond a network of friends because they fail to attract enough participants. Many intentional communities fall apart soon after their initial launch because they don’t have enough energy to sustain themselves. Communities, unlike teams and other structures, need to invite the interaction that makes them alive.” (2002: 50)

To help CoP be as lively as possible, Wenger et al. (2002: 51-63) provide a list of those principles, in the hope that making them explicit will help designers to be more flexible and improvisational:

1. Design for evolution.
2. Open dialogue between inside and outside perspectives.
3. Invite different levels of participation.
4. Develop both public and private community spaces.
5. Focus on value (to the university, to the centers that community members serve, and to the members themselves).
6. Combine familiarity and excitement.
7. Create a rhythm for the community.

Conclusions and final comments

To stay alive, university culture needs to be attractive. Attendance of a cultural event must be a rewarding action in itself, because it is pleasurable, instructive, or transformative (from life-changing to simply helpful). Because CoPs are essentially voluntary, university culture cannot be forced into existence. It requires resilience and adaptation to local and global trends.

To fulfill the third mission of universities, their social commitment cannot be reduced to simply programing cultural events on campus. The way in which the university relates to and interacts with the rest of society is crucial to its own identity and cohesion, and requires a material infrastructure of human, technological and economic resources.

After two years of action-research on the Gipuzkoa campus at the University of the Basque Country, some good practices have been identified. As described above, they aim (1) to make time to celebrate university cultures; (2) to grant autonomy to culture makers on campus; and (3) to open spaces for creativity and change, both personal and social.

The way in which the university relates to and interacts with the rest of society is crucial to its own identity and cohesion, and requires a material infrastructure of human, technological and economic resources

University culture is not to be generated from a top-down or a bottom-up approach, but rather by interaction in a network of agents on and off campus. This interaction can be improved by design so that the times and spaces of campus life make it easier for CoP to develop and thrive.

References

- Abma, T. A., Baur, V. E., Molewijk, B. & Widdershoven, G. A. (2010). Inter-Ethics. *Bioethics* 24: pp. 242-255.
- Ariño, A. (2019). Política cultural universitaria: una historia y una propuesta para la tercera misión. En: A. Casado (ed.), *Cultura dual. Nuevas identidades en interacción universidad-sociedad*. Madrid: Plaza y Valdés; pp. 23-32.

Casado, A. & Rodriguez, N. (2019). ¿Cultura dual o cultura residual? En: A. Casado (ed.), *Cultura dual. Nuevas identidades en interacción universidad-sociedad*. Madrid: Plaza y Valdés; pp. 7-19.

Garcés, M. (2017). *Nueva ilustración radical*. Barcelona: Anagrama.

Lave, J. & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge (Mass.): Cambridge University Press.

Li, L. C. et al. (2009).. Evolution of Wenger's concept of community of practice. *Implementation Science* 4 (11).

Pyrko, I., Dörfler, V. & Eden, C. (2017). Thinking together: what makes communities of practice work? *Human Relations* 70 (4): pp. 389-409.

Wenger, E., McDermott, R. & Snyder, W. M. (2002). *Cultivating Communities of Practice*. Boston: Harvard Business School Press.

Business Ecosystems and the Dualism between Universities and Cultural Industries

Roberto Moreno

Abstract

A recurring theme in economic policy is the promotion of innovation, business and cultural ecosystems. These policies touch on Higher Education Institutions (HEIs), which have the capacity to innovate in this area. When taken to the industry level, a specialised productive ecosystem engenders formal synergistic proposals for academic, governmental, business and social ties, in order to intensify coordinated actions in terms of entrepreneurship, innovation and competitiveness. Such a strategy also covers the development of knowledge, research and specialised regional production processes.

This set of relationships is grounded on an institutional regulatory framework aimed at private intervention on the local or regional economic agenda, a process that concentrates synergistic actions and economic growth strategies, investing financial resources and production into building sector infrastructure and boosting the economy, society and culture. Coordinated efforts have led to a kind of joint responsibility for HEIs, within which the demands of competitiveness in business ecosystems have led them to create cultural centres. The concept of creative economy is therefore viewed as a driver of innovation and technological change, and as a comparative advantage for the development of related business.

Elucidations of the concept of cultural industry lead to the consideration of new areas for the production and creation of cultural goods with economic value. In Western Mexico, the University of Guadalajara has played a prominent role in this process. Its University Cultural Centre is the prime physical example of its commitment to the consolidation of this industry, based on Government-University-Society ecosystems. Its contribution and commitment, developed through current institutional frameworks to foster cultural industries, extend well beyond the local setting.

Universities and the business ecosystem

Out of the so-called information society, the knowledge society was born (UN, 2006) as a concept that encapsulates social transformations. Its corpus focuses on analysis of social and territorial changes to offer a vision of the future, and to drive public actions and intervention models within public frameworks in order to foster the generation of positive cultural, social and productive changes. These changes make the specialised spatial unit (cultural, economic and social) the object of study and analysis, whose results must lead to formal proposals to promote academic, governmental, business and social ties, in order to strengthen coordinated actions geared towards entrepreneurship, innovation and competitiveness.

Synergistic action between University-Industry-Government (UIG), the Triple Helix (TH) (Etzcowitz and Klofsten 2005), can trigger regional potentialities, differentiate capacities and offer better conditions associated with quality of life. Nowadays the initial TH model has moved from its original concept to recent versions in which the Quadruple Helix (QH) (Carayannis and Campbell 2009) especially refers to the incorporation of cultural industries into society, government and university. The Quintuple Helix (5H) adds the environmental factor to the four vertices described (Carayannis and Campbell 2010).

The rapid dynamics of change under which modern cultural enterprise is facing challenges in terms of economy, markets and their failures, which are mainly changes in megatrends and high levels of competition, are no longer merely challenges that businesses are responsible for dealing with in isolation. These tasks have morphed into a kind of co-responsibility for Higher Education Institutions (HEI), within which the competitive demands of the TH spatial business ecosystems (Etzcowitz and Klofsten 2005) have led them to set up cultural and research centres of diverse characteristics and varied scopes that seek to respond to challenges raised in terms of the economy and society.

Therefore, the demands of the present-day knowledge society (Derek Chen 2005) involve new educational dynamics in line with social changes and needs for cultural and social development, which impacts learning requirements and implies the need to develop new academic areas that can respond to current educational demands (Doris 2001). This challenge is leading to higher education systems and coordination strategies that are based on criteria of quality, equity and relevance, and are closely linked to making strategic sectors efficient as generators of local, regional and global competitiveness, all of those changes are under the principles of the QH. Table 1 distinguishes between the various theoretical contributions that confer strategic roles with regard to the TH initial model among HEIs and private enterprise.

The ties between HEI-industry are viewed as a strategic relationship that also includes the development of knowledge, research and specialised regional production processes (Leyva 2005). From this perspective, HEI-industry relations are founded from a strategic concept whereby the government and its institutions, as a normative frame (North 1993), seek to put private intervention on the local or regional economic agenda. Under this regulatory framework, the state then concentrates synergistic actions of private initiative with economic growth strategies by investing funds and productive resources into the building of sectorial infrastructures and boosting economic growth and social and cultural development. Leyva (2005) establishes that the various processes of cooperation between the state and private initiative must be tied to local, regional and national strategic lines of development.

Table 1. Theoretical contributions on the role of University-Industry

Author/Year	Theoretical contribution
Faulker & Senker (1995)	Cooperation between universities and private companies is based on personal contact.
Gibbons et al. (1995)	Forms of knowledge are continually changing traditional disciplines, which has contributed to the view that the role of universities has changed more than an idealistic agreement.
Henry Etzkowitz et al. (2001)	The triple helix is an expansion of the role of knowledge in society and of the university in economics. The university is undergoing a dual transformation: an expansion of missions in order to include economic and social development, as well as education, cultural reproduction and research and the shift from an individual to an organisational focus on each mission.
Doris Schartinger et al (2002)	The role of changing knowledge and research cooperation between public research and the business sector has received increasing attention in the analysis of innovation and technological change.
Chrys Guanasekara (2004)	The role of universities has evolved over the last twenty years. The ivory tower only focuses on the traditional academic practices of teaching and research. This has become more important with the rise of the knowledge-based economy.
Pamela Mueller (2006)	Evidence of the role of the hypothesis that entrepreneurship and university-industry relations are drivers of knowledge flows and therefore foster economic growth.
Rudi Bekkers et al. (2008)	There is a wide variety of channels through which knowledge and technology are transferred between universities and industry.

Source: The author based on Celaya (2015).

Within recent theoretical guidelines in the area of regional development lies another binding element: the University and its so-called 'knowledge economy' (Derek Chen 2005) which is the product of new academic areas, aligned with social and developmental requirements. Under this principle, academia stands as an institution of strategic relevance with regards to production processes and the transfer of cultural values and specialised knowledge (Faulker and Senker 1995). Today, the modern state is not solely responsible for productive functional specialisation, and can count on the support of HEIs and their knowledge economy (Derek Chen 2005) to support businesses in increasingly more competitive environments. This is the tri-sector synergic model, whose challenge is to implement higher education models and coordination strategies based on criteria of quality, equity and relevance, which are closely linked through seeking efficiency in strategic sectors as a competitive tool (Etzkowitz, Gulbrandsen and Levit 2001).

Innovation forms part of modern enterprise, and is exposed as an essential tool for fostering knowledge and generating economic growth and competitiveness. Another element that strengthens the concept is the 'talent economy' (Goleman 1998), which maintains such traits as intelligence, determination, strength and vision, which are so essential for exercising business leadership. These include cultural traits, which must be supported by adequate physical infrastructure, specialised knowledge, government finance and highly optimised institutional frameworks.

In this regard, as a kind of hybridisation of the talent economy, the concept of creative economy emerged in the 90s to describe a creative process that drives innovation and technological change and is a comparative advantage for the development of related industry. Thus the concept of creative industries was born in Australia, and developed later in the United Kingdom, which is centrally grounded on individual creativity, skills and talents with the potential to produce wealth and employment through the generation and use of intellectual property (UNESCO 2009). The model seeks to eliminate gaps in the various disciplines and areas of knowledge, and its elementary objective is to model opportunities for: 1. The academic sphere and industry; 2. The identification of boundaries and borders in institutional frameworks; and 3. HEIs and private initiative to build knowledge together that in unison will lead to emerging hybrid organisations (Etzkowitz and Klofsten,

2005). Other integrating features are: a) Innovation in governments, HEIs and industry; b) Implantation of organisational partnership schemes; and c) HEIs with a high-innovation business focus, innovative governments that procure companies and develop them through the knowledge and strategic alliances offered by academic research.

When schematising the TH model, the university is on one of the vertices and its function is to develop research and development activities based on academic grounds. On another vertex, industry seeks clients on the basis of economic activities that in turn depend on research efforts to develop new models and business opportunities. On the third vertex, we find the government as the managing body of regulatory frameworks and political conditions that favour regional growth. A fourth helix, the modern and optimized QH model, consists of society, which should ultimately benefit from integration models within the knowledge economy, cultural development, entrepreneurship and government programmes.

Under these principles, the fundamental idea of cultural industries, the fourth propeller of the QH model, is centred on industrial reproduction techniques for the creation and mass dissemination of cultural works, which lead to a better prepared society with greater cultural development. The Quadruple Helix (QH), the theoretical base model of this article, works by adding a fourth helix described as the media-based, culture-based, public and civil society. The model inspires the perspective of the knowledge society, democracy, production and innovation (Carayannis and Campbell 2009). The Quintuple Helix (5H) presents a broader, more comprehensive map by adding the perspective of the natural environments of society. In addition to its ecological sense, the 5H model stresses the ecological transition of society and the economy, whose natural environments should thus be seen as drivers of knowledge, production and innovation, defining opportunities for the knowledge economy (Carayannis and Campbell 2010). Table 2 shows the evolution of this models.

Table 2. Evolution of the eco-systems models between Government, HEIs & Society

Author	Model	Description
Gibbons et al. (1994)	Linear or modes 1-2 model	Ways of organising knowledge are governed by the rules of science, not social responsibility, and it is transmitted in the form of academic publications in addition to being validated and evaluated by the community of specialists.
Rosenberg (1976), Kline & Rosenberg (1986)	Chain-linked model	The most important contributions of this model are: Emphasis is placed on the central role of industry, on the origin of innovation processes, the feedback between the phases of the model and the interactions that relate the sources of scientific and technological knowledge to each of the stages of the innovation process. The interaction between science and technology is taken into consideration in all parts of the model and not only at the beginning, as in the linear model. When no solutions are found, further research should be carried out. Industry gets the knowledge it needs from various sources (universities, other companies, fairs, patents, bibliographies, etc.).
Freeman (1987), Lundvall (1985) cited in Lundvall (1997)	Innovation systems	This proposes the integration of different innovation agents in complex transdisciplinary and interactive structures, where agents and organisations communicate, cooperate, and establish long-term relationships and economic, legal and technological conditions to foster a region or locale's innovation and productivity. Innovation systems have been proposed at national, regional, local and sector level.
Etzkowitz & Leydesdorff (2000)	Triple Helix	This model was proposed as a result of the review of different hypotheses on the ties between the university, industry and government. Based on the general theory of innovation, it has evolved through three versions. Triple helix I: the first version of the model states that relations between academia and industry are run under general government administration. Some examples of this version are found in countries with socialist governments, such as some countries in Eastern Europe and Latin America, where the state plays an important role in the industrial sector. Triple helix II: the second version separates the institutional spheres, affirming their autonomy. This version is limited by the strong barriers between one sphere and the other, as well as the pre-established relationships. Triple helix III: this version establishes an infrastructure for the generation of new knowledge, in which the institutional spheres overlap in such a way that each takes on the role of the other. It is at these interfaces where hybrid or interface organisations emerge and an ideal area called the Trilateral Network or Hybrid Organizations.
Carayannis & Campell (2006)	Mode 3	Emphasizes the previous innovation modes by increasing the pluralism and diversity of the knowledge and innovation modes as necessary factors for advancing societies and economies. Encourages interdisciplinary thinking and transdisciplinary application of interdisciplinary knowledge.
Carayannis & Campell (2009)	Quadruple Helix	This model adds a fourth helix called 'public', defined as media-based and culture-based public and civil society. This fourth helix is associated with "media, "creative industries", "culture", "values", "lifestyles", "art", and perhaps also the notion of the "creative class".
Carayannis & Campell (2010)	Quintuple Helix	The Quintuple Helix is a five-helix model and the natural environment represents the fifth helix. The model can be represented as a framework for transdisciplinary and interdisciplinary analysis of sustainable development and social ecology.

These models, especially the so-called QH, have proven strategic for all sectors involved, and is the basis for the success and growth of cultural industries in several nations of America, Europe and Asia. There is greater interest in the academic and cultural fields, which are viewed by government and industry as agents of integration. The essential dynamic environments of innovation and cultural development are triggered under this cooperation scheme (Doris 2001). For HEIs, such cooperation implies extension and dissemination to make traditional systems more modern, productive and efficient. The integration of so-called 'co-working' schemes to university entrepreneurship centres helps foster brainstorming that engenders business plans and models within the knowledge economy that can be supported by different kinds of government funding. The design of physical spaces within cultural industries is the most tangible materialisation of a region's expressions of artistic knowledge (Rosenberg 1976).

For HEIs in Mexico, it is essential to recognise the guiding principles of cooperation with the production sectors, as access can be gained to highly important social projects, generating professional cadres that are closely tied to the regional strategic sectors. The exercise of cooperation processes, through collaboration agreements, enables access both to public funds and to knowledge flows in research centres and cultural training spheres that are generated and developed by expert researchers and are theoretical concepts for strengthening strategic local and regional sectors. In Mexico, HEI-industry cooperation strategies are born from organisations like ANUIES that, among other roles, maintains cooperation programs, business incubators, research institutes, technical assistance centres, university start-ups, and scientific and technological parks, where thousands of cooperation projects have been developed that benefit companies, mainly small ones. In terms of culture, the University Cultural Centre (CCU) at the UdeG is the prime example of its commitment to the cultural industry on the basis of University-Industry-Government (UIG) ecosystems.

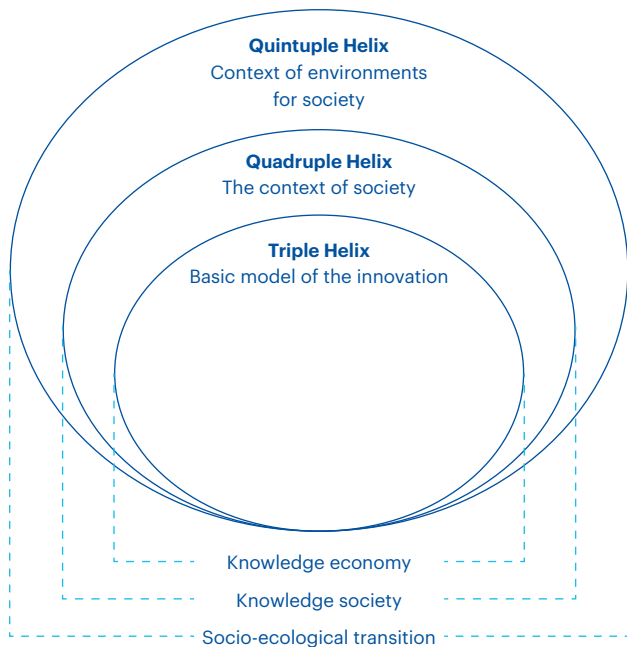
So, when taking an institutional view of UIG inter-linkage as a starting point, the design of strategic plans in higher education needs to work towards fine-tuning its actions and operations through strategic planning techniques, focused on improving specific productive sectors to foster an increase in business culture, bolster its competitiveness and strengthen its regional presence (Gibbons et al. 1994). These major tasks require

rethinking of the guidelines on the development of knowledge in relation to analysis of the cultural industry, its related strategic sectors, entrepreneurship, regional innovation, value chains, clustering, business development, the development of managerial skills and intellectual property, to achieve goals in terms of economic and competitive betterment, and social growth.

The current challenge of the QH relates to the necessary relationship between Industry-University and a productive society that maintains a relevant productive role, where interlinked relationships generate better conditions in terms of business, employment, salaries, production chains, productivity, competition, creation, promotion and dissemination of culture and, consequently, better local and social development. It is a two-way win-win process, in which the competitiveness factor is present in universities and companies, with the government, via its institutional framework, acting as guarantor for the growth-planning processes, and with society as the receiver of the generated benefits. University knowledge through cultural extension and dissemination is a driving force for growth and development. It is the responsibility of HEIs to generate academic-educational knowledge for the benefit of productive organizations and development of the cultural industry.

In this scenario, in order to improve the current conditions of cultural entrepreneurship in Mexico, the most viable option is effective cooperation between industry, university and government in their different spheres to generate greater opportunities on the basis of entrepreneurial ideas and initiatives that will transform cultural knowledge into business ideas built on highly innovative grounds, scale companies to achieve their utmost growth, promote the creation of spin-on companies, develop production chains (clusterisation) on a local and regional scale, improve the productive base, boost employment and, above all, make the current cultural business a trigger of economies of scale that would generate greater profits that should then lead to societies with a higher level of knowledge, productive specialisations, more efficient payment schemes, greater and better income and, most especially, achieve local, regional, social, productive and family economic growth. Figure 1 shows the transition and base elements of the TH, QH and 5H models.

Figure 1. The integral context of business ecosystems.



Source: (Carayannis EG, Campbell DFJ, 2010)

University policies and the development of the cultural industry at the University Cultural Centre (CCU)

The *Zona Metropolitana de Guadalajara* (Guadalajara Metropolitan Area - ZMG) is the second biggest economic, social, productive and cultural city in Mexico. Its diversity of cultural icons range from *charrería* (rodeo) to tequila, and it is famed for its schools of mainly the arts, architecture, music and literature. The culture of the Western region of Mexico is by no means exclusive to the ZMG and it also reaches such tourist resorts as Puerto Vallarta, where both locals and visitors are able to enjoy its art galleries. Jalisco's cultural influence crosses the state borders into the entire Western region of the country.

The relevance of the University of Guadalajara in this process of disseminating and developing the cultural industry dates back a long way and has been documented in the form of laws, education policies, membership of specialised agencies, and modernisation to meet today's knowledge demands through education reforms that form an integral part of its *Planes de Desarrollo Institucional* (Institutional Development Plans - PDI). As

has been established, the institutional framework is relevant for achieving the goals of the university cultural industry. The planning, design and construction of the *Centro Cultural Universitario* (University Cultural Centre - CCU) at the University of Guadalajara have been present since the first IDPs in the form of scheduled actions that are consolidating and shaping the whole project.

This project is an essential part of the Mission and Vision of the UdG and the substantive function of the university's culture is especially reflected in a strategic forward-looking view. It is unquestionably important for the university cultural industry to have its own Mission and Vision, mainly focused on encouraging social involvement in cultural processes, strengthening its forms of expression, decentralising its actions and reinforcing its physical infrastructure.

In this regard, and considering that the UdeG is the second most important public HEI in the country, the weight of its work on cultural matters is on a par with its importance in Mexico and internationally. The International Book Fair and the Guadalajara International Film Festival are particularly important. There are other highly renowned programs to promote the university cultural industry in the fields of literature, music and the plastic and performing arts. The achievements are not only institutionalised products under clear legal frameworks, for funding has been a core area without which this project would not have succeeded. From the beginning of the 21st century, the Cultural Centre Trust has been financed with its own and public funds, the latter coming from a mix of Banobras, SEP-Conaculta, the Jalisco and Zapopan governments and private investors, which guaranteed the university's policy regarding the promotion of culture and the protection of rights to the CCU.

The development of the CCU as the living embodiment of the university cultural industry did not happen in isolation from major national guidelines. From an institutional perspective, its design adhered to applicable federal policies to guarantee the preservation, strengthening and promotion of cultural life. The strategy was especially aligned with the inter-institutional coordination schemes as ordered by government and society. The coordination actions also considered the guidelines established by the 2013-2033 State Development Plan (Jalisco, 2019) in order to align the CCU with the comprehensive development of Jalisco. Finally, the CCU could not ignore the 2030 Institutional Develop-

ment Plan (UdeG, 2019), meaning that its actions were in general alignment with the requirement to: a) Organise, promote and disseminate scientific, technological and humanistic research; b) Recover, conserve and disseminate culture, and c) collaborate with education authorities on cultural matters.

The convergence of policies and institutional frameworks in the CCU's current plans for the cultural industry has led the University of Guadalajara to set regulations to consolidate the promotion of culture and creativity through physical infrastructures distributed across more than 170 hectares, which support this thriving industry and cater for the demands of a growing number of consumers. The most important facilities include: a) State Public Library supported by more than 3 million units of information and digital databases designed to meet the daily requirements of almost 4,000 users; b) Telmex Auditorium, an 11,500 capacity venue that serves more than one million people a year and that covers an area of 31 thousand square metres, and c) Performing Arts Centre, with more than 25 thousand square metres of facilities with different halls designed to stage shows, concerts, opera and ballet and sound and light systems for all types of events. The Cine Foro cinema, Museum of the Arts, Diana Theatre, Casa Escorza and Casa Vallarta, among other facilities, complement the university's cultural agenda.

From an institutional perspective, the UdeG's model for the cultural industry, brought to life by the CCU, is the living expression of the institutional coordination between the university, government and society. It is the university's response to offer a cultural agenda to a society with increasing demands in terms of quality, facilities and variety. Through its University Network and extension programs, the University of Guadalajara has produced a huge number of cultural extension programmes and projects in the ZMG and the west of the country. The UdG has consolidated a highly institutionalised cultural industry.

Conclusions

At present, the university cultural industry is clearly structured within the UdG from the perspective of an ecosystem that is formed and supported by government and society, and which grants exposure to its cultural policy. The main guidelines that support the project are the Organic Law that governs education and research directives to promote and disseminate culture, and the Institutional Development Plan, instruments through which the UdeG fulfils its humanist mission and vision by offering inclusive cultural options for the benefit of society.

The directives of the different cultural policies are aimed at the generation of contents that challenge the existing paradigms on the university's role as a creator and patron of the cultural industry. The UdeG gives equal consideration to a business concept that is highly related to the so-called creative industries. The alignment of federal, state and local institutional frameworks with those of the University engenders complementarity in matters of the arts, science, knowledge and cultural expression.

The University of Guadalajara has a strategy aimed at fully exploiting the conditions of an economic and social context for the generation of cultural and artistic projects, always seeking a balance between contents. The model means it is possible to reshape the concept of the creative and cultural industries by also making them a source of funds that can be reinvested to further increase the cultural agenda, consolidating the university's policy to such an extent that it is now among the most relevant nationwide, redesigning cultural circuits in a constructive manner, catering for social and cultural needs, establishing commitments with key cultural stakeholders and organisations, and seeking to contribute at all times to local, state and national cultural coverage.

The contributions and commitments forged by the UdeG through the current institutional frameworks for the good of culture are more than local matters. Its efforts to adapt to the demands of a changing cultural environment, from the principles of innovation in the cultural industry, are undeniable and plausible, as reflected in their national and international recognition.

References

- Carayannis, E.G. and Campbell, D.F.J. (2006). *Knowledge creation, diffusion, and use in innovation networks and knowledge clusters. A comparative systems approach across the United States, Europe and Asia*. Praeger, Westport.
- Carayannis, E.G. and Campbell, D.F.J. (2009). Mode 3" and "Quadruple Helix": toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 201-234.
- Carayannis, E.G. and Campbell, D.F.J. (2010). Triple Helix, Quadruple Helix and Quintuple Helix and how do knowledge, innovation and the environment relate to each other? A proposed framework for a trans-disciplinary analysis of sustainable development and social ecology. *International Journal of Social Ecology and Sustainable Development*, pp. 41-69.
- Celaya, R. (2015). *Cono-ciencia*. Ciudad Obregón: ITSON.
- Derek Chen, C. D. (2005). *The knowledge of economy*. The KAM methodology and World. Washington, DC.: World Bank.
- Doris, S. (2001). Interactive Relations Between Universities and Firms. *Journal of Technology*, pp. 255-268.
- Faulker, W., and J. Senker (1995). *Knowledge frontiers: Public sector research and industrial innovation*. Oxford: Oxford University Press
- Gibbons et al. (1994) *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage.
- Gobierno de Jalisco (2019). Plan Estatal de Desarrollo Jalisco 2013-2033. Mexico: Dirección de publicaciones del Gobierno del Estado de Jalisco. Retrieved from: https://sepaf.jalisco.gob.mx/sites/sepaf.jalisco.gob.mx/files/ped-2013-2033_0.pdf
- Goleman, D. (1998). *Working with emotional intelligence*. New York: Bantam Books.
- Etzkowitz, H., M. Gulbrandsen and J. Levit. (2001). *Public Venture Capital*. New York: Aspen/Kluwer.
- Etzkowitz, H., and M. Klofsten. (2005). The innovation region: toward a theory of knowledge-based regional development. *R & D Management*, pp. 243-255.
- Leyva, S. L. (2005). *La Vinculación de la ciencia y la tecnología con el sector productivo: una perspectiva económica y social*. Culiacán, Sinaloa: Universidad Autónoma de Sinaloa.
- North, D. (1993). *Instituciones, cambio institucional y desempeño económico*. Mexico: Fondo de Cultura Económica.
- Rosenberg, N. (1976). *Perspectives on Technology*. London: Cambridge University Press
- UN. (2 June 2006). Towards knowledge societies: UNESCO world report. Retrieved from UNESCO: <https://unesdoc.unesco.org/ark:/48223/pf0000141843>
- UdeG. (12 April 2019). COPLADI UdG. Retrieved from: www.hcgu.udg.mx/sites/default/files/sesiones_cgu/2013-2014/2014-03-24%2000%3A00%3A00/pdi_2030
- UNESCO. (2009). *Políticas para la creatividad. Guía para el desarrollo de las industrias culturales y creativas*. Paris: UNESCO Publishing. Retrieved from: <https://es.unesco.org/creativity/sites/creativity/files/220384s.pdf>

Case Study — The Case of “Ateneu Barcelonès”

Jordi Jiménez

The case of Ateneu Barcelonès is one-of-a-kind, and it perfectly exemplifies the challenges expressed by the 7th GUNi Higher Education in the World Report (HEIW7).

Located in Barcelona, and under the auspices of the Greek goddess of knowledge, Athena, this 150-year-old private cultural institution has served since its foundation as an intellectual benchmark where humanities, science and technology have been equally disseminated outside of the higher education system through the efforts of civil society.

Nowadays, our institution has two main functions. On the one hand, it hosts one of the best libraries in the country —with more than 250,000 documents, most of them unique— which supplies historic and contemporary documents to both members of the institution and researchers. On the other hand, it is devoted to spreading knowledge and generating intellectual debate towards society by inviting some of the best speakers from around the world to public sessions. We also host the “Escola d’Esriptura”⁽¹⁾, the biggest European academy of literature, whose aim is to forge new poets and novelists. All in all, Ateneu Barcelonès can be defined as the place where civil society has historically organized itself to conserve, generate and spread humanistic and scientific knowledge.

Even though this twofold agenda has guided the institution since the beginning —with a splendid outcome—, Ateneu Barcelonès is not alien to the new challenges faced by our society of knowledge, which is becoming more open, interconnected and global than ever. These challenges, accompanied by the boom of new technologies, require big changes in order to continue the expansion of knowledge and culture that is still the core value of our institution. Therefore, certain measures are being implemented to update and upgrade such institutions in accordance with the requirements of the society of the 21st century.

In order to keep up with these challenges, our institution is developing an ambitious programme called “@ Ateneu hub”, which aims to create a network of cultural knowledge and participation that will enhance the synergies between society, ideas and resources by connecting everything that happens and is produced at our institution. These goals have been achieved by creating an ICT Commission, a new and interactive website and by training new members in technology and communication. However, the true revolution has been the adaptation of our valuable archives in order to generate fruitful results today.

Arguably the cornerstone of Ateneu Barcelonès is its library, which historically introduced European free-thought and science at a time when local universities were in a precarious condition⁽²⁾. Nowadays, in changing times and as other institutions take over the Ateneu’s traditional work, the library is reinventing itself. It has evolved from being a closed-receptacle of erudition to an open access and dynamic generator of knowledge. Since 2017, our catalogue has been completely digital, adapted to international cataloguing standards and accessible to universities and researchers. In addition, new developmental policies are being implemented, which are now more focused on completing our archives with contemporary thought, ecology and sustainability. In order to integrate our peculiar ecosystem into the nexus of high-knowledge, our library has engaged in both local and European projects, such as Europeana⁽³⁾ and Google Library Project⁽⁴⁾.

However, one of our most outstanding projects is the “Arxiu de la Paraula”⁽⁵⁾ which aims to digitalize every single speech recorded at our institution from 1973 onwards and offer them to the general public⁽⁶⁾. All

1. <https://campusdescriptura.com>

2. The study of the influence of our library in the 19th century is digitalized in our “Portal Almirall” <http://almirall.ateneubcn.org:9080/Almirall>

3. <https://www.europeana.eu>

4. <https://www.google.com/googlebooks/library/>

5. <http://arxiudigital.ateneubcn.org/>

6. <https://www.youtube.com/watch?v=tDvnYM-Z5Bc>

these innovations are a work in progress, since our library participates in the Impact Centre of Competence in Digitisation⁽⁷⁾ and the IFLA World Library and Information Congress⁽⁸⁾ that keep us innovating year by year.

Our other main activity, as mentioned before, is offering public lectures and debates on a variety of topics. According to our 2018 report⁽⁹⁾ we have organized +800 activities with an attendance of +46,000. Speakers at our institution have included such famous scholars, poets and artists as Bertrand Russell, Igor Stravinsky, Ruben Darío and Salvador Dalí. Today, and thanks to @teneu Hub these lectures are now streamed live and later uploaded to YouTube. This allows us to reach more people and keep them engaged by interacting with us from home. This is a kind of knowledge-sharing that only institutions like ours are able to offer and that we firmly believe will lead the future of humanities.

Continuing with the creation and spread of knowledge, it is important to stress that our institution is divided into twelve areas: Science and Technology, Politics, Law and Sociology, Philosophy, Art, Literature, Film, Drama, Chess, History, Music, Ecology and Economics. The diversity of topics is enhanced by the rotation of the directors of each area, who are democratically chosen by the members of the institution every three years. This allows us to offer a particular and collaborative approach in each area that would be impossible to achieve at a rigid institution that is always governed by the same team.

Following the fundamental aspects of the HEIW7, I have implemented two measures in the area that I direct (Philosophy) that are working especially well. The first, in consonance with the @teneu Hub digitalization process, is the creation of social media, where the content created by my area, mainly in humanities, has reached +250,000 users who can interact with us in innovative ways. The second is collaborations with other institutions, especially those of higher education, and not only universities, but also scientific societies, public institutions and private cultural associations. The creation of these synergies means we can reach new audiences, and we also benefit from offering university-level content. I believe that my area can serve as a “harmonic

counterpoint” to universities, and this is positive both for universities and society, for we act as a bridge to safeguard culture as a means to inclusion for everyone.

Taking all of this into consideration, Ateneu Barcelonès can be viewed not only as a refuge for the humanities outside of academia, but also as a necessary complement to what universities have to offer. This should not be seen as competition between these two institutions, but as a way to overcome the dualism between universities and society. Even though universities put much effort into giving back to society the knowledge that they generate and are more open to doing so than ever, it is only third-party societal actors like these that can serve as the nexus that joins humanities, science and technology together in a multi-level ecosystem.

Returning to the fundamental aspects of HEIW7, on an epistemological level, our institution is working towards a reconfiguration of the relationship between knowledge areas, enhancing humanities by adapting them to the new scientific and technological paradigm, which also means fitting our traditional culture into a global world. On an institutional level, institutions like these, as the product of initiatives by civil society and individuals, have proven that, if innovative measures are implemented, the regression and residualisation of humanistic areas can be prevented by creating synergies with the higher education system.

Further information: <https://www.ateneubcn.org/>

7. <https://www.digitisation.eu/>

8. <https://www.ifla.org/annual-conference>

9. https://www.ateneubcn.org/sites/default/files/memoria_2018_ab.pdf

Case Study — Creating Art of Science

Dobrivoje Lale Eric

The Center for the Promotion of Science (CPN) in Serbia is a public institution established in 2010 by the Government of The Republic of Serbia with the task to promote science and technology. According to its mandate, the Center cooperates with research and educational institutions (universities, research centers and schools) in Serbia and worldwide, and works closely with government ministries as well as the media and the business sector.

The Center regularly organizes exhibitions, lectures, panel discussions and other events on different topics (math, artificial intelligence, robotics, archeology, climate, genetics, biology, etc.). The most prestigious examples are “May Month of Mathematics – M3” (annual event since 2012), “Days of the Future: Robotics”, “Children’s Science Camp” (twice a year outreach program since 2014), “CERN in Serbia” and the “art+science” series (annual event since 2016). The driving force and essential task is for all formats to be designed in an interactive manner, so that participants, visitors and users can be integrated and deeply involved in the content and learning mechanism.

CPN’s mission is to bridge the gap between science and society by bringing together researchers, educators, artists, policymakers, CSOs and NGOs, business and industry, and the general public in the research and innovation process. The ultimate aim is to influence and adapt research agendas in order to reflect society’s needs and to address key societal challenges. Through numerous actions on the regional and national level, the Center is promoting the ideas and concepts of Responsible Research and Innovation and Open Science. The integration of society in research processes is one of the CPN’s biggest concerns. One valuable examples of this is the effort being put into promoting gender equality in STEM areas, such as motivating girls to study science and running coding classes for them. The Center is also supporting diverse public events on intriguing questions related to the main scientific discoveries and controversies of today and tomorrow, with the aim of bringing science closer to all citizens and increasing the level of science literacy among the general public and espe-

cially the younger generation. The focus is currently on climate change and artificial intelligence as two of the most relevant scientific and societal issues of our time.

Since the early days of its existence, the Center has been working on different levels of international cooperation and knowledge exchange. In 2019, the CPN is participating in 14 out of a total of 32 EC funded projects set up since the first one in 2012. These multilateral collaborations are supported by different programs and calls, such as Horizon 2020, Creative Europe, Erasmus+, FP7, LLP, COST and others.

Through different concepts and program activities, the Center has been exploring possibilities for deeper integration of creative and artistic methodologies, approaches and values into (in)formal learning process, multidisciplinary research and the collaborative engagement of diverse actors. These attempts can be viewed as transformative actions related to global initiatives for integration of a simple “A” into STEM, thus becoming STEAM – Science, Technology, Engineering, Arts and Math.

From a more general approach, the CPN has started to initiate, foster and support direct art & science collaborations in 2014 after its involvement in the European Digital Art and Science Network (Creative Europe project). As a founding member of the Network, which has involved three major European scientific institutions as external partners – CERN, the European Southern Observatory (ESO) and the European Space Agency (ESA) – CPN has contributed to shaping the first sustainable, live network that has managed to bring together creative minds coming from seemingly opposing disciplines – arts and sciences. Together with other partners from Dublin, Kosice, Zaragoza, Ljubljana, London and Gijon, and led by Ars Electronica, a brand new stage has been established for deeper and more explorative analysis of the current interdisciplinary practices that are arising more than ever around the globe. In the meantime, the network has been expanding and now includes thirteen partners throughout Europe, supported through the active Creative Europe project – European ARTificial Intelligence Lab – AI Lab.

Back in 2014 and 2015, the founding art & science events in Serbia were a presentation of the nine best national submissions to the Network's open calls for artists at the May Month of Mathematics in 2015 and a workshop for 60 local artists, researchers and practitioners, held in Belgrade in December 2015. The first major one-month art & science event was held at the Cultural Centre of Belgrade in April 2016, showing works by four guest artists and groups, while premiering the work of two winners of the national art and science selection, the first ever public call in Serbia for the creation of original artworks with strong scientific background and content. At about the same time, the Center became involved in another intriguing and outstanding project entitled Quantum Music, where the complex territory of quantum physics has been explored by means of contemporary classical music.

Since 2017, art & science activities have been visually represented under the common denominator of art+science. In April and May of that very year, the biggest art and science festival so far was held in Serbia, comprising several exhibitions and more than a dozen parallel events, with the participation of about 30 national and international artists. The main programs were presented in three galleries at the Cultural Centre of Belgrade, as well as the Gallery of Science and Technology at the Serbian Academy of Sciences and Arts, CPN's Science Club and at several other venues and art faculties in Belgrade, Novi Sad and Kragujevac. The educational content was carefully developed to offer a diverse range of workshops for school children, art students and young artists.

As the Center dedicated 2018 to the Makers culture, a logical decision was made to combine framing concepts and open our premises for the one-month art+science-makers program. This brand-new concept inspired and produced original projects, unique creations and technological solutions at several venues in central Belgrade. Most of the artworks were developed by collaborative teams of artists, creative individuals and researchers. The highlight of the program was an international conference attended by renowned European experts and practitioners from Ars Electronica, the Waag Society, several universities and research institutes, etc. The main goal of the two-day event was to present recently developed novel and inspirational practices, exchange ideas and knowledge, and foster networking between national and international professionals. The main conference day gathered around 250 people from 20+

countries from all over the world at the Faculty of Dramatic Arts in Belgrade.

CPN is currently developing a program for November and December 2019 to present the concept of art+neuroscience. Neurosciences is now a central topic for creative encounters and curious challenges with two goals – exploration of the key elements of artificial intelligence as a super-scientific platform and understanding of the neural basis as one of least known elements of living organisms. Further programs will be developed in the future with the clear goal of addressing and inspiring climate actions in view of scientific knowledge, creative thinking and AI as an inevitable tool.

cpn.rs

eu.cpn.rs/en

cpn.rs/artandscience

10. Universities are part of each country's political system and depend on its decisions in the fields of education, research and the fostering of innovation and knowledge. How can universities maintain their autonomy but at the same time foster impact as agents in their respective societies?

The Balancing Act of Societies and Autonomous Universities: How Universities Could Do Better

Sijbolt Noorda

Abstract

Universities should be autonomous in order to be able to do their job well. At the same time, they are very much dependent on the social contract that maintains them, whether this contract is public or private, political or not. Autonomy is usually discussed in terms of law making and funding. Are universities allowed to act independently and design their own programmes? Do universities receive sufficient generic funding that enables them to set their own spending preferences? Such questions are certainly relevant. Yet they do not cover all the bases. Universities are granted their autonomy for a reason and for a purpose: to be useful to society and responsive to its needs. So it is also relevant to ask what universities are for and what contribution this or that particular institution makes to present and future society.

In other words, the social contract underlying a university's existence is a truly bilateral contract, one party allowing autonomy and independence and the other side committing to responsiveness and usefulness. This is by no means a once and for all formal agreement that is well-defined for all time. Rather the social contract between university and society implies and reflects a dynamic relationship. Over time and for all sorts of good or less good reasons the terms of the contract are being re-interpreted and re-applied. It is crucial for both sides to be well aware of this and ready for it. There are, however, a good number of complications that make this balancing act between universities and societies rather hard to accomplish. To mention just a few of these: societies are neither unified nor uniform agents, societal needs of the future are often overshadowed by present requirements, it is not exceptional for political systems and their life-cycles to be at variance with societal developments, and – last but not least – universities themselves are not usually homogeneous communities holding to a wide variety of values and preferences.

This paper will discuss these complications and conclude that there is no easy way out. Full engagement on both sides is very much desirable. So is clarity about what is at stake and above all, the identification of and adherence to key values.

*'We've lost that sense of our public-university role,' she told me. 'Everybody's emulating the wealthy, prestigious universities.' In a tone that I appreciate for being at once pointed and polite, Natalicio criticized colleges that seem more focused on raising rankings than expanding access. She was equally dismissive of institutions that put more energy into empire building than serving students in their communities**

In theory it is very simple. Universities should be autonomous in order to be able to do their job well, to do what they are good at. It is equally important for universities to understand what they are good for. Universities do not exist for themselves. They are of course meant to serve their students well, and on a larger scale the society they are part of.

Autonomy is a crucial condition for success in scholarly research, for critical quality in teaching and learning as well as for unfettered defining of the institutional mission and academic hiring criteria. And successful research, high quality teaching and learning, as well as well-functioning academic institutions, is exactly what societies expect from universities.

In practice it is more complicated. Autonomy doesn't come easily. It is usually defined in terms of law making and funding. In an ideal world, legal provisions allow universities the freedom to act independently when organizing their institutions, hiring their fellows and

*A fragment from a piece by Goldie Blumenstyk for *The Chronicle of Higher Education*, interviewing Diana Natalicio, president of the University of Texas at El Paso: A Veteran President's Laments and Lessons From 3 Decades at the Helm. Found 01.05.19 at <https://t.co/1YCcOrMaio>.

designing their programmes. Sufficient generic funding ideally allows them to do what they are good at and to set their own spending preferences.

Yet both the legal framework and funding arrangements are subject to political preferences and societal demand or pressure, not just in general, but very concretely. Universities are granted their autonomy for a reason and for a purpose, i.e. to be useful to society and responsive to its needs.

In consequence, lawmakers and funders are sorely tempted to give specific instructions or warnings as to what universities are supposed to be good for, and what contribution this or that particular institution should make to present and future society.

Although all universities do accept that they are accountable for the ways in which they use their mandate, their independence and their funding, they have a problem with narrow and specific, and also unreliable and changeable, expectations and guidelines.

In most cases, the two sides should be able to strike a balance, avoiding extreme positions. The social contract underlying a university's existence then is a truly bilateral contract, one party allowing autonomy and independence and the other side committing to responsiveness and usefulness. This is by no means a once and for all formal agreement, well defined for all time. Rather, the social contract between university and society implies and reflects a dynamic relationship. Over time and for all sorts of reasons the terms of the contract are being re-interpreted and re-applied.

Amidst all change there should, however, be a constant: a fair balance between autonomy granted and returns demanded. Simply said, not easily done. If one looks into the social contract and its dynamics over time, one finds a good number of complications. Apparently, it is quite a challenge to perform this balancing act of universities and societies well.

Universities should not be for sale

Strange as it may seem, a first challenge is immediately linked to the greatest successes of universities.

All over the world the good news is that Higher Education systems and most individual universities are in high demand. They are seen as crucial tools of progress, carriers of the knowledge economy and indispensable providers of smart solutions to future issues. They are growing in number and in size. In consequence, they cannot complain about a lack of interest in what they have to offer. This interest, however, is not just expressed by passive appreciation or benevolent applause. The opposite is true: as there is a multitude of benefits at stake, stakeholders are keen to express their claims, make their specific requests, and voice their particular expectations about the university. Most of these are increasing in most places. Apparently, universities are seen as useful by many and for many uses.

This multitude of demands, however, translates into *competing* claims to ownership and *rivalling* concepts of the university. A particularly telling example is research universities struggling to keep their balance and protect their integrity and freedom in situations where sponsors demand direct impact and short-term successes.

Another example is the setting of educational priorities, such as deciding which student population to serve and to what end curricula should be redesigned. Are we educating global elites and/or fighting inequalities? Are we focusing on marketplace skills and/or on civic virtues? A highly relevant matter these days is deciding which values to base one's international educational strategy on. Is being an international institution a service to the marketplace of talent in the interest of brain gains or an engaged choice for bridging cultures and fighting inequalities?

Are we educating global elites and/or fighting inequalities? Are we focusing on marketplace skills and/or on civic virtues?

All of this indicates that universities are at a *crossroads* of *various interests* and ever more demanding *stakeholders*. Under such circumstances autonomy easily suffers.

The basic concept of university autonomy is rooted in a clear sense and acceptance of the role and value

of academic expertise. Academia is and should be an open-minded community, dedicated to methodical critical inquiry and unbiased scrutiny of its findings. For this to happen, independence is crucial. No research paths should be closed, and results and conclusions should not be pre-set. It was to allow academia to function and develop along these lines that autonomy became a core condition in the first place.

Lawmakers, funders and all other stakeholders subscribing to this role and mind-set of academia are enablers and should accept this role and stick to it. Their expectations should be generic and not prescribe in a detailed order what exactly is expected in terms of results and what the no-go or low-priority areas of inquiry and education are. Yet it is precisely this attitude of generous appreciation of professional expert judgment that has come under pressure. These are precisely the ones who highly appreciate science, and who very much like to plan and steer the fields, courses and uses of academic research and teaching. In their minds, academia is more or less akin to a consultancy agency that one hires to do a job, for a particular purpose.

An additional problem is, of course, that this issue will clearly be unacceptable in its extreme modes and manifestations, but it is not all that clear in in-between situations. A minor shift towards a field of preference, and a rather generous grant for a certain study on the one hand, and an eagerness to please and to prove to be useful on the other - the road towards the present successes of and high demand for universities is full of them. One may easily conclude that it is all a matter of degree, that it is all relative. And new patterns of behaviour and acceptance are just as easily being established. What seemed to be outrageous two decades ago is an accepted practice today. Roles have gradually become confused. An independent institution may become a provider, for sale to any stakeholder with sufficient buying powers.

Universities should reassess their links to society

The successes of universities have not only generated applause and stimulated demand. They have generated criticism and scepticism as well. A particularly relevant example is the erosion of the public support base for universities. In many countries, the 20th century had

seen a growing consensus towards public funding of Higher Education as an obvious case of furthering a public good. For many a decade increasing numbers of students have benefited from this attitude. Universities were seen and appreciated as agents that worked towards the public good.

In recent years, however, the concepts of public good and general interest have lost much of their force. Individual and group interests have gained in prominence as drivers of national policies and as motives of the electorate. Where consensus and solidarity are being replaced by diversity and group-interest-based lobbying, past arrangements may easily be losing their support base. Universities may be losing their agent-that-works-towards-the-public-good status and reputation. They are then labelled as partisan rather than as autonomous and serving the general interest.

The concepts of public good and general interest have lost much of their force. Individual and group interests have gained in prominence as drivers of national policies and as motives of the electorate

This shift in public support should be more than a matter of concern and complaint, of wanting to travel back to a golden age when things were good. It is a pressing invitation to reappraise how exactly universities are serving society, how they can do better and in particular how they can respond to a context marked by division and diversity rather than by solidarity and unity. If they fail to do so, their autonomy and freedom will run the risk of being taken for a cloak of self-interest or traditional elitism.

Universities should serve society. It is their *raison d'être*. Preparing new generations for professional roles in society, contributing to the development of culture and civilization, as well as supporting innovations in the workplace, in technologies or in energy production and use, are all major responsibilities for academia. University people have truly internalized this truth: they know that their end users are companies and communities, schools and start-ups, hospitals as well as hydrogen plants. They are so used to thinking that everything they do is done well when viewed from the perspective of society. However, here as everywhere convenient truths may be blocking their view.

Three years ago, we were in Berlin, at a meeting of mainly German and UK academic leaders. Our con-

versations were about one topic and one topic alone: the Brexit vote of the week before. All of us were surprised by the results and worried about the impact. Yet our British colleagues were quick to state that the real surprise for them had been the realization that they had been reading their electorate completely wrongly. The evident logic of EU benefits for their universities and research funding had been blocking their view of others, many of their fellow citizens in other communities, with other priorities.

This example is easily multiplied. It shows that we all have our society of preference, the kind of society or the part of society we work for and are familiar with. Particularly in our highly fragmented societies it is very easy to be picky about the kind of society we are working for.

Although our commitment to equity, to do justice to all, should prevent us from being picky, it should not lead us to side with those players and those institutions in society that seem to be our natural allies or our best paying partners rather than with those that would benefit from our support most.

Universities in many countries are viewed as elite institutions, not because of their high-quality output, but rather because of their being part of the establishment and serving the interests of that same establishment. Whether this reproach is entirely correct or not - in many cases I think it is too simple - it certainly points to an important issue. If we are to serve society, we should ask ourselves which society that is. We should ask whether the society that pays best or has most visibility and the loudest voice should be the society we are to serve in the first place. Does higher education really offer equal opportunities to all? Does our research really benefit society at large, diverse as it is?

These questions should be discussed seriously at our universities⁽¹⁾. Best practices should be sought. Easy answers are no option. This is a challenge faced by each and every university in its own setting. The Magna Charta Observatory has recently launched its Living Values Project, which – put simply – is an invitation for universities worldwide to engage in internal debate to reassess their joint value base and re-evaluate whether they have got their priorities right as to how they should be serving their fragmented societies best⁽²⁾.

1. For a recent instructive example of the results of such deliberations at a global level see <https://www.guc-hamburg.de/press/declaration-rebuilding-university.pdf>.

Does higher education really offer equal opportunities to all? Does our research really benefit society at large, diverse as it is?

Universities should engage in interdisciplinary programmes and skills

Which brings me to my *third* point.

My tenure in university leadership positions from the late seventies well into the new millennium has allowed me to observe long waves of change in the global world of higher education and research. It is truly amazing to note how much has been achieved, in terms of reach and impact as well as in terms of quality and scale. From ivory towers for the happy few, universities have become halls for the many. From very national institutions they have become crossroads of international collaborations. Just look at the development of the Bologna Process into the European Higher Education Area of 48 countries from Iceland to Armenia, Kazakhstan to Portugal. And imagine a Europe without the many present joint research endeavours that it generously supports in many different ways. Yet even the most welcome of developments eventually reach a point where one cannot just continue along the same lines. Old universities have not become old by simply sticking to what they once were, but by reinventing themselves, identifying the new challenges and providing new responses.

Of all the issues that warrant reappraisal I mention only one, namely our long and very successful tradition of disciplinary teaching & learning and research. This tradition has brought us great successes, no doubt about that. Yet there are many good reasons for serious adaptations. Not only the observation that new insights in science are very often found in the no man's land between disciplines or on the squares where disciplines meet. Not only the observation that in many professions young graduates are expected to work in multidisciplinary teams and have the skills to successfully do so. Above all the observation that many of the key challenges faced by human life on this planet require multilateral thinking, complexity studies and interdisciplinary skills.

2. <http://www.magna-charta.org/activities-and-projects/living-values-project>

The Magna Charta Universitatum of 1988 correctly stresses our responsibility for the future of our societies. It uses lofty language to emphasize our responsibility for our ecosystem. *'The future of mankind,'* it says, *'depends on cultural, scientific and technical development,'* of which universities are key drivers, as centres of culture, knowledge and research to serve society⁽³⁾. This is to be done by teaching younger generations but also requires a broader service to society. As a main feature of education and training it is stated that universities must teach respect for *'the great harmonies of their natural environment and of life itself'*. From this it is immediately clear that the MCU presents a future-oriented outlook, in the interest of a broad development of societies along with the promotion of due respect for the natural environment. At that time the far-reaching and structural consequences of such a future-oriented outlook had yet to be seen. This is exactly why we at Magna Charta Observatory have begun work right now on a new version of the 1988 statement. It is too early to say what it will be like. But I would not be surprised if it did not, among other features, voice our strong aspiration to re-organize our teaching & learning and do research across mono-disciplinary boundaries and into new configurations of study and research.

Of all the issues that warrant reappraisal I mention only one, namely our long and very successful tradition of disciplinary teaching & learning and research. This tradition has brought us great successes, no doubt about that. Yet there are many good reasons for serious adaptations

If universities are to be true to their calling to serve future generations well, they should not shy away from adapting their structures and programs to this end. Whether the issue is social cohesion or the lack thereof, sustainable economies and how to get there, renewable energy and its price, the ethics of the digital age, sustainable food & nutrition, healthy aging – in all these cases we cannot make progress unless we collaborate, unless we make crossovers, unless we dare to be different.

Last year the first cohort of students on the new *Future Planet Studies* undergraduate program at my Amsterdam University were evaluating their experience. A large majority liked what they had learned, would do it again and would recommend their peers to do like-

wise. Their most important criticism, however, was about their teachers. Not about their academic quality or their teaching skills, but precisely because of their lack of interdisciplinary experience and attitude. The program is certainly interdisciplinary, they said. And they have learned to be exactly that. Yet their teachers were lagging behind.

I know no better testimony to illustrate what I said before. For universities to successfully engage in working towards today's great challenges we – teachers and researchers – must be committed to rethinking and retraining ourselves. From those who have done so I have learned that this is no pious wish. It can be done and it can be done well.

Recommendations to universities

Discussions on university autonomy very often focus on the need for robust regulations and fair policies. In many cases they are mainly about legal conditions and political protection. This is easily understood. In the absence of the right kind of legal provisions it is hardly possible to act independently. Yet this is only part of the story. It is equally important to realize that autonomy must be paired with accountability, that the independent status of the university is no end in itself but meant to enable high-quality service to society. This is the social contract on which the existence of each and every university rests. The narrative of autonomy and accountability, of a social contract between university and society and the balancing act of universities and societies is a true and helpful narrative. It points to essentials and it helps to get things right. But however true and helpful it may be, it does not present the whole picture.

What I have tried to show is what the balancing act of universities and societies implies and requires in everyday reality. It presents quite a challenge. In terms of dealing with a multitude of often competing claims and expectations of stakeholders, in terms of mapping society in all its formations and groupings and finding a reliable compass to know where to go and what to do, as well as in terms of in-house adaptations and innovations to be able to respond to society's present and future needs. It is absolutely clear that a university needs a good degree of autonomy to get things done and get them right. Yet autonomy is not enough.

3. <http://www.magna-charta.org/magna-charta-universitatum>

I would like to conclude by making three recommendations to universities.

The first recommendation is on *leadership*. Autonomy is a crucial precondition for a university. Making good use of it is just as crucial. For this, courageous and strong leadership is essential.

I began this piece with a quotation from President Diana Natalicio observing how many colleagues are emulating the wealthy, prestigious universities, and focus more on raising rankings than expanding access. She is equally dismissive of institutions that put more energy to empire building than serving students in their communities.

Autonomy is a crucial precondition for a university. Making good use of it is just as crucial. For this, courageous and strong leadership is essential

This kind of emulative drift is a very common phenomenon. It takes strong leadership at all levels of the university to stay away from this particular kind of contagion. Doing one's own strategic analysis by seriously mapping one's potential contribution as well as the pressing needs of the community one serves requires a good degree of courage and leadership powers.

My second recommendation is on the importance of a *collective sense of direction*. Universities are usually devolved organisations, archipelagos of self-determining units rather than obedient hierarchies. This is how it should be in academia. Autonomy should not be restricted to the institutional leadership level⁽⁴⁾. This is, however, no *carte blanche* for a structure of fragmentation and a culture of everything goes. To be effective as a university, internal collaborations and the setting of priorities are essential. To that very end, the creation of a collective sense of direction is a top priority. This should be done in an all-inclusive, bottom-up type of process in which many members of the academic community are actively involved.

This immediately links to my third recommendation, on *shared values*. Autonomy is a crucial value for any university. It is not the only one, however. In addition to key enabling values like autonomy and academic freedom there are crucial operational values like pro-

fessional fairness and integrity and social values like equity and responsiveness to societal needs. Without such values as a shared conviction of the academic community, a university is little more than a theatre of individual careers and personal ambitions. Competition for jobs, grants and awards is stimulating individual rivalry rather building collegial partnerships. If a university is seriously committed to serving its society, it needs such collegiality, based on shared ideals and shared values. Universities should work on this, openly and widely discuss different approaches and diverse ideals, and find ways to function as an open and diverse academic community based on shared values rather than as a collective of highly individualistic academic rivals. To help universities to do so, the Magna Charta Observatory has developed the Living Values tool⁽⁵⁾. Early adopters have reported that it is indeed a helpful means to assess a university's value base, stimulate the participatory quality of the academic community and as a result re-energize it to ensure it is in good shape and ready for its collective mission.

4. Noorda, S. (2013). Academic Autonomy as a Lifelong Learning Process for Universities. Leadership and Governance in Higher Education. Retrieved from <http://lead-project.org/sites/default/files/2017-04/Academic%20Autonomy%20for%20Universities.pdf>

5. <http://www.magna-charta.org/magna-charta-universitatum>

Case Study — SciTech DiploHub - Barcelona Science and Technology Diplomacy Hub

Martí Jiménez and Alexis Roig

New challenges from climate change to global health, migrations and food and water security, together with rapid developments in areas such as artificial intelligence, robotics and gene editing require strong cross-border interactions between science, technology and humanities. These synergies can add value to multilateral decision-making on shared global concerns. Both international and interdisciplinary partnerships emerge as a crucial tool to enhance public, cultural and political understandings of global challenges past, present and future through the expertise of different regions and areas of knowledge. Higher education institutions should be the vehicle for fostering such integration.

The role of higher education in international relations has traditionally been seen through the lens of cultural diplomacy. Student and faculty mobility, language and cultural exchange have been the dominant modes. However, higher education institutions have changed dramatically in the last two decades, introducing important new dimensions. It is not just students and scholars who are moving across borders: so are scientific programs, research projects and education policies. The landscape of higher education is being reshaped by international partnerships and expert networks, global mobility programs and the worldwide circulation of higher education reform policies.

In this new context, higher education diplomacy is playing an increasingly more relevant role in today's geopolitics as a tool of soft power. Universities are critical in implementing the United Nations' 2030 Agenda, turning it from a global vision into a tangible reality. They are best suited to become the pivotal actors of effective multi-stakeholder partnerships between the scientific community and public and foreign policy practitioners, as well as the private sector and civil society.

As one of the leading knowledge ecosystems and a hub for international organizations, Barcelona launched

SciTech DiploHub (Barcelona Science and Technology Diplomacy Hub), the nonprofit public-private partnership in charge of deploying the world's first city-led science and technology diplomacy action plan. Contemporary global cities with solid science and technology ecosystems like Barcelona are uniquely suited to translate their knowledge, resilience and productivity into global progress.

Backed by Barcelona's leading universities, research centers, non-profits, corporations, startups and public institutions, SciTech DiploHub has the mandate to represent its science, technology and higher education ecosystem abroad and make the city an influential player in the global arena through its contribution to the Sustainable Development Goals (SDG). It promotes sound transdisciplinary dialogue, where humanities play a crucial role in re-imagining the future and discussing the social, ethical and legal implications of science and technology, making the city a laboratory for solutions to challenges that respond to a global logic but are manifested at a local level, thus paving the way for other global cities committed to a smarter, more sustainable future.

SciTech DiploHub empowers the global diaspora of talent in science, technology and humanities educated in Barcelona's higher education and innovation ecosystem and based abroad, the Barcelona Alumni network. Barcelona Alumni members are a crucial element of the city's science diplomacy strategy as intercultural communicators, ambassadors of its knowledge ecosystem and education, and promoters of business and trade. By enhancing this interaction, Barcelona is creating opportunities for partnerships and sharing ideas and insights that add value to research and higher education institutions and innovation industries while enhancing its global competitiveness. Over 150 world-class professionals from top-tier global universities, research institutes and tech companies gathered at the Barcelona Alumni Global Summit last December to rethink the future of

the city's science, technology and innovation ecosystem and engage with its science diplomacy strategy.

SciTech DiploHub also organizes the Barcelona Innovation Days, international forums held at the world's leading innovation hubs such as Boston, San Francisco, London, Paris and Shanghai. They bring together the most prominent stakeholders from academia, startups, industry, and public institutions to strengthen relationships with Barcelona's innovation ecosystem; promote the exchange of ideas between science, technology and humanities; engage with the Barcelona Alumni members in the area and support the active engagement of the city's higher education and research institutions in the international exchange of knowledge, ideas and talent. The first edition was held in May at Harvard's Kennedy School in Boston.

Furthermore, to leverage the confluence between innovation and foreign action, the organization has developed the Barcelona SciTech Diplomatic Circle initiative, a platform to engage the more than a hundred diplomatic missions and international organizations serving the city and research and higher education institutions in periodic visits and encounters. Heads of missions, counselors, attachés and officers dealing with science, technology and innovation from consulates, embassies and international organizations have the chance to forge new bonds with Barcelona's science and technology scene and connect back to their countries.

SciTech DiploHub also positions itself as a think tank to build knowledge, publish insights, inform policy on the geopolitical impact of science and technology and to consolidate Barcelona as an innovation hub that is ready to meet humanity's societal challenges, focusing on multidisciplinary approaches and open to public-private partnerships. Its Policy Lab makes the scientific and technological know-how of Barcelona's higher education system easily accessible to institutions, policymakers and international actors in the city. These organizations benefit from an independent and apolitical interface where scientific expertise and innovation can be harnessed in support of public policy, and of the concrete needs of practitioners of international relations.

To conclude, the organization partners with international institutions such as the European Organization for Nuclear Research (CERN), the Union for the Mediterranean and the American Association for the Advancement of Science (AAAS) Center for Science Diplomacy to offer top-notch capacity-building in city-

led science and technology diplomacy. Together with the Barcelona Institute of International Studies (IBEI), it organizes the Science and Technology Diplomacy Summer School, a first-of-its-kind training program with the will to train the next cohort of leaders in a field where it is increasingly more essential to tackle humanity's global challenges, with a special focus on Europe, the Mediterranean and the role of global cities.

SciTech DiploHub is an ambitious and future-oriented project that intends to explore the benefits of the confluence between science, technology and humanities; between innovation and foreign action; between local and global talent; between the scientific potential of Barcelona and a world where challenges and responsibilities no longer have borders.

Further information: <http://www.scitechdiplohub.org/>

Part 4

Education

11. How can education curricula be designed to integrate different areas of knowledge on the basis of common problems in an interrogative, critical and cooperative manner? How should learning methodologies be focused in order to benefit transversal humanism?

Resolving Complex Situations at the Heart of the Curriculum: the Situation in Andorra

Marta Llop

Abstract

The paradigm shift that took place within Andorra's education system in 2009 had an impact on many levels - from a re-thinking of the citizen profile that we wish to see at the end compulsory education to classroom practice. The Strategic Plan for the Overhaul and Improvement of Andorra's Education System (PERMSEA) launched this new pedagogical approach, attributing a key role to the development of competences and the ability of pupils to act effectively in real-life and complex situations. This reform therefore affects the curricular framework, methodological foundations, syllabus, assessment model and the roles of pupils and teachers. The student profile is expressed in the form of general competences (globally). The methodological approach involves distinguishing between learning spaces: Workshops, which are focused on the acquisition of the necessary resources for developing specific skills, and grouped into Programmes (analytical level); and Global Situations that go beyond the discipline, and where global issues are put forward, the resolution of which entails the integrated mobilisation of resources from a range of areas of knowledge. The link between Global Situations and Workshops is achieved via unit maps (at a global level), which ensure a coherent progression of skills development at different stages. Within the unit maps, the social, science and technology areas are found in the majority of Global Situations in order to encourage student reflection and action on issues related to humanity and to do so in critical and cooperative ways; as well as raise issues that are socially, scientifically and technologically current. In the classroom, lesson units are based on complex situations that need to be resolved. These ensure that pupils exercise the competences that we have previously selected and that they mobilise resources from different areas. Under this model, pupils are at the centre of their learning process. They see the need to learn in order to solve a challenge. They think critically and collaboratively, planning, implementing, self-evaluating and so on. The role of the teacher in the classroom is to guide pupils' activities so that they move towards mobilising the resources they need in order to

develop the scheduled competences. This Global Analytical-Global cycle is the basis of an integrated teaching approach that overcomes the limiting perspective of a discipline; and enables approaches between knowledge areas based on real-life problems in a critical way.

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1. Introduction

The paradigm shift that took place within Andorra's education system in 2009 was largely in response to the issue posed in the 7th edition of the GUNi Report.

This change has had an impact on many levels: from a re-thinking of citizens' profiles so that people can

live together in harmony, respectfully and critically in a changing society that presents major challenges for the future improvement of mankind, to practice in the classroom, with a consequent change in the roles of both pupils and teachers in the teaching-learning process.

It is on performance levels that I will be setting out the reformulation of education conducted by Andorra's Ministry of Education and schools in Andorra.

This is on the understanding that we are still engaged in this reform process - a process that steadily self-assessed, corrected and improved as it progressed, based on multidirectional and ongoing feedback from different parts of the education community, such as pupils, parents, teachers, school management teams and support departments within Andorra's Department for Education.

In our case, this feedback is flexible and the responses and improvements can be made relatively quickly because Andorra is a small country with an education system serving 4,559 pupils (data from September 2018).

There are also pupils in Andorra who form part of the Spanish (2,823 pupils in 2018) and French (3,581 pupils in 2018) education systems.

For reasons of space, this report will focus on secondary education (pupils aged 12-16 years old) in Andorra's Education System (Catalan acronym "SEA") (2,985 pupils in 2018).

2. Proposal for profound change to Andorra's Education System

In 2009-10, Andorra's Department for Education proposed the need to implement a paradigm shift within Andorra's Educational System ("SEA") as a result of growing interest in developing citizens' increasing skills and competence, and granting them the ability to adapt to the constant changes they are subjected to in society and with the conviction that aligning ourselves with new trends in European educational policy is the way ahead.

PERMSEA - the Catalan acronym for "Strategic Plan for the Overhaul and Improvement of Andorra's Education System" - was created to provide a new pedagogical

approach to Andorra's Education System, attributing a key role in the development of skills and the ability to act effectively in diverse and complex real-life situations, based on the knowledge, skills and experience that pupils acquire.

This new approach has completely transformed the previous processes of teaching, learning and assessment.

PERMSEA was implemented progressively across compulsory basic education during the 2013-14 academic year and began to be implemented at secondary school level (age 16-18) during the 2017-18 academic year.

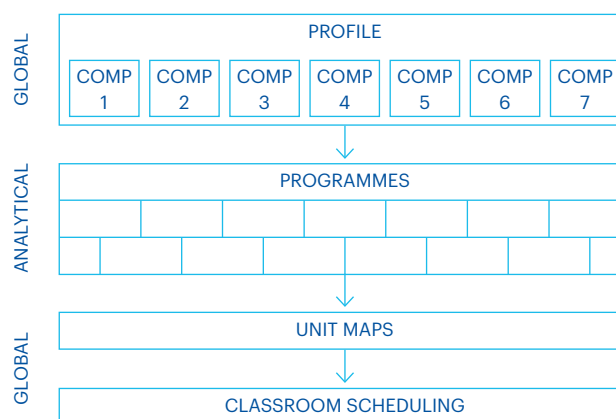
2.1 Which aspects has PERMSEA changed?

This real, effective and profound reform affects all elements of Andorra's Education System, such as: the curricular framework, methodological fundamentals, syllabus and assessment model.

The curricular framework for Andorra's School System is made up of four levels of implementation:

- First overall starting point: the basic skills that we expect from young people when completing compulsory education;
- Second intermediate analytical point: the programmes;
- And a final overall end point, consisting of two parts: curriculum planning maps and curriculum planning.

Figure 1. Type of curriculum implementation process: overall - analytical - overall. From the document "Curricular Framework for Andorra's School System" (7/4/2017)



2.2 Pupil profile (overall level)

The pupil profile expresses the values, aims and educational intentions arising from a demand for social consensus.

This profile, expressed in the form of general skills (see SEA Decree Regulating Compulsory Basic Education of 4/3/2015) takes an overall perspective, and allows an individual's dimensions to be viewed from a holistic and non-fragmented perspective.

The general skills include:

- Social competence and democratic citizenship.
- Multilingual communication skills.
- Mathematics, science and technology skills.
- Digital proficiency.
- Cultural and artistic skills.
- Learning to learn skills.
- Personal autonomy and initiative.

The SEA Decree Regulating Compulsory Basic Education, of 4/3/2015, shows how to have an impact on these general skills in the classroom.

It states that "This profile cannot be interpreted as the sum of different skills, each of which is independent in nature; quite the contrary. Developing any one of these seven skills always depends on developing another. (...) "one's own critical thinking for social competence and democratic citizenship also plays an important role in the development of scientific skills as well as cultural and artistic skills, among others.

Upon completing secondary education in Andorra, a pupil's profile is therefore a coherent, consistent and cohesive set of competences that are required for living, participating and interacting in society."

These general competences are the benchmark for all education professionals and are based on specific and key skills, built up through the programmes.

2.3 Educational areas

The educational areas align with the problems inherent in today's Andorran society that pupils will have to deal with in their lives, and make up the core around which the curricular framework of Andorra's school system is constructed (see document "Curricular Framework for Andorra's School System" of 7/4/2017).

The educational areas permeate throughout the specific competences and are implemented as part of educational initiatives that must guide the actions of the education community. The areas are: Self-management and initiative; Environment and consumption; Mass media; Health and welfare; and Citizenship and co-existence

2.3.1 Self-management and initiative

The purpose is for pupils to organise, plan and evaluate their own learning processes and work independently with perseverance and effort, based on the recognition and appreciation of their own interests and abilities in order to guide the development of their personal and professional futures with an entrepreneurial attitude.

2.3.2 Environment and consumption

The purpose is to maintain an active and responsible relationship with the environment, looking critically at the impact of technological development and consumption on its sustainability. If we are to preserve our environment and not deplete resources, it is essential to encourage responsible consumption that does not go beyond actual needs.

2.3.3 Health and well-being

The purpose is to develop healthy lifestyles and habits based on knowledge of one's own body in order to achieve a positive adjusted self-image that enables the person to develop in a balanced and more secure manner.

2.3.4 Citizenship and living together

The purpose is to act with respect, honesty and tolerance and with a spirit of solidarity. This entails analysing social facts critically, rigorously and impartially and integrating values of democratic participation and relevant cultural aspects in order to promote both the pupil's own development and that of Andorran society.

2.3.5 Mass media

The purpose is to develop a critical and ethical understanding of the media and make responsible use of media tools, whilst respecting individual and collective rights.

These five areas permeate our school curricula on all levels:

1. On the level of general skills within pupils' profiles by the time they complete compulsory education.
2. With regard to specific skills within the area as well as across the different areas.
3. Within the unit maps.
4. And within the curriculum planning units - particularly in the learning space that we call the "Global Situation".

2.4 The programmes (analytical level)

Within the Curricular Framework for Andorra's School System, dated 7/4/2017, the concept of competence is defined as an action or intervention that integrates and mobilises an organised set of learning resources (facts and concepts, procedures, attitudes and values), aimed at successfully resolving a complex situation or problem in life.

The components that make up the general skills, as well as the underlying scientific evidence, make up the main model for specifying particular skills, which are grouped into learning areas. Any competences that do not come under any area of knowledge are considered to be key skills.

On the basis of determining specific and key skills, a selection is made of the knowledge required - facts and concepts (knowledge), procedures (know-how), attitudes (know how to be) - as well as the strategies and tools that enable pupils to develop these skills. For each competence, the evaluation criteria are determined along with end-of-year expectations and guidelines for teaching and evaluation. All these elements make up the syllabus for each area of learning.

The development of specific skills involves pupils mobilising on the basis of a number of resources (content, tools, instruments, strategies) related to a particular field of knowledge aimed at solving situations or problems that arise in the classroom. The development of key skills involves mobilising meta-disciplinary resources that are also essential for resolving situations.

We believe that it is difficult to get an exact idea of what this means without knowing about the way skills are approached within our system's programmes. We put forward two examples: the skills covered by the Humanities and Social Sciences Programme (2018) and by the

Key Skills Programme (2016 - currently being amended).

Skills covered by the Humanities and Social Sciences Programme:

- C1. Interpret the geographic space based on analysing the interaction between human groups and the natural environment over time and on different spatial scales.
- C2. Understand historical evolution based on analysing the political, economic, cultural and social changes, on different scales of time and space.
- C3. Analyse current social issues critically and creatively.

Key skills programme:

- C1. Solve everyday problems in a creative way, based on thinking and information-processing skills.
- C2. Manage one's own learning making use of necessary strategies and tools.
- C3. Establish positive and cooperative relationships with others, based on knowledge and appreciation of one's own body, emotions and desires.
- C4. Participate fully in the community's social life by exercising citizenship actively and democratically .
- C5. Share knowledge, ideas and proposals using different formats and media and different languages.

3. Upgraded learning spaces

The methodological approach of overall and skills-based learning has led to differentiation within learning spaces. On the one hand, the acquisition of the specific resources (learning content and strategies) that may be necessary for pupils to use in their intervention in specific situations needs to be encouraged. Equally, learning in the process of skills-based education needs to be made possible, in order to equip pupils to mobilise their knowledge in an integrated way so that they can act in a given situation.

Thus, in order to meet these needs, the first stage of secondary education (12-14 years) differentiates between the following spaces: Workshops, Global Situations and Tutorial Action (here, we focus on Workshops and Global Situations).

3.1 Workshops

Workshops are learning spaces that correspond to the areas of learning. Workshop-based learning focuses on acquiring the necessary resources to build the specific skills.

This work, however, is done by applying leading psycho-educational based learning, bearing in mind that significant and motivating learning is encouraged. Pupils therefore work with resources based on an approach to real-life situations centred on the discipline. Pupils are guided towards analysis and in-depth learning of those specific aspects that are decisive for the subsequent mobilisation of resources in the area. They start with comprehension activities and memorising exercises.

3.2 Global Situations

In order to foster the development of a greater degree of more complex skills that go beyond the discipline, the proposal is the use of global problems that, in order to be solved, involve the integrated mobilisation of resources from different knowledge areas. It is with this purpose in mind that we have created the Global Situation (GS) space.

The pupils have to solve complex situations, applying strategies and procedures learned in other learning areas or contexts. The methodological approach behind this space requires the pupils to think for themselves about proposed actions and plan, self-evaluate, redirect and propose solutions that could apply to the case presented. This is ideal for working on key skills.

In GSs, they work using the resources and procedures that are necessary for their activity, without regard to how they are classified within the different disciplines.

The relationship between the two learning spaces, Global Situations (GS) and associated Workshops, is based on the alignment of skills to be developed and the resources. It may be that a resource is presented in an integrated way and contextualised within the global situation, whereupon work is done during the workshop on understanding and practising, and it then re-appears in the global situation.

This link between the GS and the Workshop is ensured when the units map is prepared.

3.3 Curriculum planning unit maps (overall level)

The globalising nature that should define the teaching and learning process means it is necessary for its global nature to be restored during the last stage of development of the the curriculum. This global nature is reflected in the shaping of the curriculum planning unit maps that are implemented in schools.

The unit maps are documents that distribute and specify skills and resources throughout the academic year and ensure coherent progression in the development of skills. To facilitate the relationship between the Workshop and the GS, temporary units have been established that delimit a shared duration. The GS is the situation to be resolved that articulates the relationship between the different learning spaces, their competences and resources.

In the case of workshops associated with a GS, the specific competences of the area are developed as part of the workshop and resources are widely and deeply acquired, so that the pupil can, when necessary, mobilise them in an integrated way as part of the GS.

In producing the unit map, priority has been given firstly to the areas of Human and Social Sciences, Physical Sciences and Nature and Technology, which are those that occur in most Global Situations - precisely because they provoke reflection and action on the part of the pupil with regard to the problems of humanity and do so in a critical and cooperative manner. And secondly, they raise questions that are socially, scientifically or technologically current, with a focus that is appropriate to the pupil's age and situation.

To provide a graphical representation of what has been explained so far, we present an example: the "Insufficient blood reserves" GS which focuses on a GS for the 1st year (aged 12-13), viewed from the map.

Human and Social Sciences, Physical Sciences and Nature and Technology, provoke reflection and action on the part of the pupil with regard to the problems of humanity and do so in a critical and cooperative manner

Complex situation:

Based on an article in the Andorran press, pupils are told that blood reserves are insufficient to cover the country's needs, and that a lack of donors in the Principality has been identified...

The workshops associated with this GS and the competences developed are:

Physical and Natural Sciences

- C3. Making responsible decisions using scientific criteria on socio-scientific matters.

Mathematics

- C3. Solving complex mathematical situations using a range of mathematical techniques.

Visual and Plastic

- C1. Interpreting visual and plastic manifestations in a critical manner.
- C2. Expressing themselves using visual and plastic manifestations.

Catalan language

- C1. Acting appropriately in different oral communication situations, both academic and non-academic.
- C3. Writing a range of texts in a coherent and cohesive way, with clear communication.

Key competences

- C1. Solving everyday problems, based on thinking and information-processing skills.
- C2. Managing their own learning, making use of necessary strategies and tools.
- C5. Sharing knowledge, ideas and proposals using a range of formats and media, through different languages.

The resources for each workshop are selected from the relevant Programme. I present them here very briefly in order to help with an understanding of the subsequent curriculum planning unit.

Resources for the associated areas:

Physical and Natural Sciences

The circulatory system; review and modification of a simple functional model; developing explanations based on research; awareness of the complexity of the body...

Mathematics

Calculations using integers, fractions and percentages.

Visual and Plastic

Identifying visual manifestations: purposes and functions; creating visual messages according to their narrative function; applying multimedia techniques.

Catalan language

Planning and writing a reasoned discourse; composing advertisements; critically assessing advertising and other persuasive texts.

Key skills

Techniques for searching for, selecting and gathering information; implementing a work plan.

Reflecting on and recognising one's own options.

Presenting information.

The map takes into account the number of hours a week devoted to each learning space. In our case, the GS is given significant weight, at 10 hours per week (pupils work simultaneously on two problems or global situations, for 5 hours per week each). The syllabus establishes a teaching schedule for the workshops of between 1.5 and 3 hours per week, depending on the learning area. In the 1st year, the GS's are focused on multiculturalism, on the universe, on consumption, and on the media, etc.

4. Changes to the methodological approach and classroom work

Finally, we come to the scheduling of the teaching and learning process carried out by the teacher through the design of the scheduling units (SU). Within the specific framework of the classroom, the SUs respond to the questions of why, what, how and when to learn and evaluate.

Using this model, the pupils are at the centre of their learning processes. They see the need to learn in order to solve a challenge; they think critically and work with fellow pupils, planning, implementing and self-evaluating so that they can improve, etc

The way the classroom is organised varies socially according to learning needs. In any case, cooperative learning in global situations carries a lot of weight: teams are an important part of living together, socialisation of a group, and learning about, respecting and managing diversity.

The role of the teacher in the classroom is to guide the pupils' planning and activities towards the resources they need in order to develop the skills planned for the given situation. In lesson planning, the teacher reflects on how to create the need for new learning and prepares and facilitates motivating, rich, global situations.

4.1 Curriculum planning units

The curriculum planning units reflect the way that competence, global, significant and functional work is set out by the unit maps.

The psycho-pedagogical "requirements" of competence-based teaching - that is to say: 1) new learning should from the outset provoke a cognitive conflict within the pupil; 2) it is functional and can be used in other contexts; 3) it is significant and the pupil can relate it to previous knowledge, etc. - means that learning situations begin from a complex situation that must be resolved, and which must ensure that the pupils exercise the competences that we previously selected, and that they mobilise resources from different areas.

It is for this reason that the teaching-learning sequence has well-defined phases, both in workshops and in global situations.

The three phases of the sequence are:

Preparation phase: this is the initial phase, in which the pupil is prepared for new learning, causing a cognitive conflict. In this phase, we differentiate several sub-phases that relate to the goals of the process, such as: reviewing previous knowledge so that pupils are aware of what they already know or need to learn; a motivating activity that predisposes them to new learning; formulating hypotheses, questions and proposals around the complex situation with the aim of identifying the most relevant issues; and delimiting the object of study through subsidiary questions.

Resolution phase: this, along with the associated sub-phases, is when the resolution plan is created, and when pupils work on acquiring and mobilising resources, as well as preparing their output, conclusions and so on.

A complex situation can have several resolution plans and, consequently, several plans and productions.

Integration phase: this is the metacognition and evaluation phase of the process.

In this phase, overall conclusions are drawn based on reflecting on the process. Procedures that have been used are evaluated along with any issues that have arisen. Theories are developed about the learning. And the level of new skills developed is confirmed, through pupils' self-evaluation and addressing a new skill situation, in the form of an individual test.

4.2 Example of a complex situation: *Insufficient blood reserves*

In the case of "Insufficient blood reserves", the SU (scheduling unit) has been defined as follows: based on the complex situation presented, two questions were defined in the *preparation phase* and which frame the work blocks:

- Question 1: Why is it important to donate blood?
- Question 2: How can we help to increase reserves?

In the *resolution phase*, pupils specify the resolution plan for each of the questions and, with the teacher's guidance, plan, organise and carry out the activities.

Question 1

Pupils acquire resources about blood (components, functions, origin, blood groups and so on) and about the circulatory system. They research the blood-donation process (what happens to blood, how is it stored, the importance of holding reserves etc.). The sources of information will be bibliographical and audiovisual, and there is also a talk by a Red Cross volunteer. Research is done in cooperative teams and, using all the information, each group creates an information leaflet.

Question 2

Pupils make proposals on how to energise and organise an advertising campaign aimed at blood donation and work that could be done during the day of the blood-donation campaign (a Blood Collection Campaign day aimed at the general population has been agreed in advance with the Red Cross).

Pupils gather resources about advertising and creativity and analyse other campaigns before deciding what they will produce (slogans, logos, posters, audiovisual adverts,

interviews, and so on), and which of the country's media they will approach (press, radio, TV), and organise themselves to carry out an advertising campaign and create their output. Lastly, they organise the time slots and tasks to be carried out on the day of the campaign.

During the *integration phase*, pupils draw conclusions and theorise about new learning and the process, and also conduct an evaluation.

We note that the February 2018 Campaign was a success in terms of participation and the pupils energetically learned everything that was scheduled. Their evaluation was very positive.

Andorra is a very small country. It would be very interesting for the improvement we are looking for to share reflection, tools and strategies with other similar education approaches that aim for a holistic and competency based dimension at the core of students' learning processes.

That is why the possibility of networked reflection, to enrich each other and deal with pedagogical issues through mutual contributions and questioning, could be considered.

5. Conclusions

With regard to the paradigm shift set out herein, and given our experience in Andorra, by way of conclusion we would emphasise three ideas:

- The Global-Analytic-Global cycle as an approach to integrated teaching that goes beyond the limiting vision of the discipline. And therefore, create specific or tailor-made learning spaces for this work by pupils.
- During the learning sequence, once in the classroom, the teacher must clearly differentiate between resource acquisition, from everything necessary to make progress, and mobilisation, linked to action, which is what gives teaching its skills dimension. This is a significant qualitative shift in classroom practice, as well as a change of role, which must be backed by good training.
- Such a profound change to most education structures is made as we move forward. For this reason, the instruments are constantly being re-built and improved, and adapted to the way in which the system and its key players are evolving. In the case of Andorra, as a result of this ongoing reflection, since PERMSEA began, we have already had second improved versions of Programmes, Maps, Curriculum Planning Units, Teacher Training and so on. We believe that it is important to view these second versions as an alignment of Andorra's Education System to the needs of our children and young people in terms of operating within and advancing our society. And it must surely be seen and experienced as a constant challenge for improvement.

Assemblages in Higher Education: a New Learning-Teaching Approach through the Prism of Social Space, Transdisciplinary Practices and Contemporary Art

Quim Bonastra, Monica Degen, Rosa M. Gil, Daniel Gutiérrez-Ujaque, Gloria Jové, Guillem Roca

Abstract

This paper presents a methodological approach to university teaching capable of integrating inclusive, reflective, critical, creative learning processes and enablers of social change in the lifestyles of students and teachers within higher education. This approach is based on the concept of assemblage, social space, the uses of contemporary art practices and transdisciplinary perspectives. To illustrate it, we present a case study that integrates the subjects of Geography and History in the second year of the degree in Social Education and the subject of Industrial Automation from the degree in Industrial Engineering (speciality in Mechanics and speciality in Electronics) at the University of Lleida (Spain). Students from both degrees carried out a joint learning project based on urban space in the city of Lleida. All of the students' projects were based on the Sustainable Development Goals from the 2030 Agenda. Our results emphasize three aspects. Firstly, the importance of incorporating novel methodologies in teaching from an assemblage perspective. Secondly, the use of contemporary art as a catalyst for possibilities and a strategy that allows rhizomatic thinking, offering the freedom to create the knowledge and understanding required to rethink education. Finally, the use of sensory, spatial and corporeal practices to develop and implement new ways of teaching within different fields of higher education such as geography and industrial engineering.

1. Introduction: A liquid becoming...⁽¹⁾

Intensified globalization processes require higher education to transform in response to the rapid changes in modern-day societies. However, much of higher education remains submerged in an industrial education system, in which memorization and homogenization are fundamental features. The legacy of Edward Thorndike with his behavioural law or Frederick Taylor with his model of industrial efficiency are still present in many training contexts of the 21st century. We propose that instead, higher education must draw on creative, inclusive, reflective training models that are capable of being coherent with the diversity emerging from society.

This article proposes a methodological approach to university teaching capable of integrating inclusive, reflective, critical, creative learning processes and enablers of change in the lifestyles of students and teachers. This will strengthen their reflective and critical positions within society and their social responsibilities. To do so, we show how alternative teaching perspectives are possible within higher education, where pedagogical approaches are constantly seeking other references, other knowledge and other views (Saéz 2018).

We are inspired by the plan of action, approved by UNESCO in 2015, in favour of humanity, the planet and prosperity based on the 2030 Agenda and its Sustainable Development Goals. Here, education is regarded an essential element for improving people's lives and fostering sustainable development. Teachers who share these approaches are committed to ensuring an inclusive, equitable and quality education, promoting coherence in line with 21st-century social values.

1. This research is part of Daniel Gutiérrez-Ujaque's doctoral thesis that will be submitted in November 2019.

Developing our teaching from the Sustainable Development Goals allows us to break from traditional teaching models that compartmentalize subjects and disciplines and generate significant learning situations for both students and teachers.

In order to test this approach, a transdisciplinary project was set up among students from two academic years (2017-2018 and 2018-2019). This project emerged within the subject of Geography and History in the second year of the degree in Social Education and the subject of Industrial Automation from the degree in Industrial Engineering (speciality in Mechanics and speciality in Electronics) at the University of Lleida (Spain). We brought together a mix of students from both degrees to work together and generate possible social and technical responses to the problems present in today's society.

2. Towards real change in education perspectives

The design of education curricula to integrate different areas of knowledge based on common problems requires a flexible approach to science. Kuhn (1962) considers that science is not something linear, but changing, as it has to continuously adapt to the social, political or technical context it exists in. Social constructionism suggests that learning at school or university happens through what Berger & Luckman (1966) describe as 'communicative interaction': language, body behaviour, etc., which demands the presence of the other. Hence, learning processes acquire meaning from the social interaction expressed through language.

Keeping the social constructionist approach in mind, we now discuss the different elements that make up the methodological approach that we are proposing for university education. These elements arise from the methodological triangle based on contemporary art, hybrid spaces and autobiographical narratives (Jové, Bonastra, Gutiérrez-Ujaque, Sebastian-Novell 2018). Likewise, approaching this perspective from within the subjects of geography and history enables other factors to enter into play, such as the concept of social space and the philosophical concept of assemblage as the bringing together of heterogeneous elements that create inter-transdisciplinary networks.

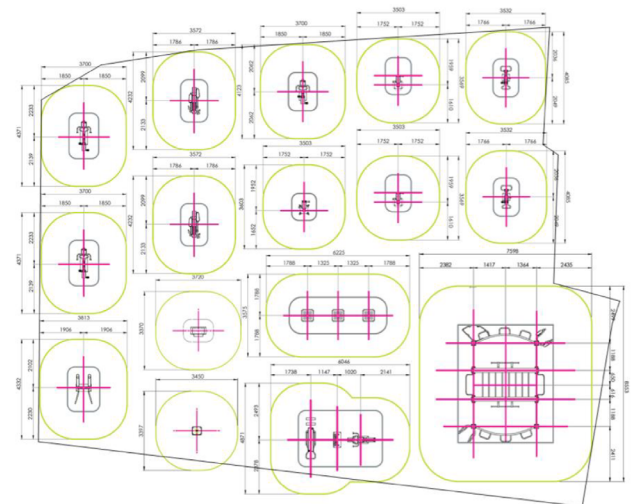
To highlight specific aspects of this approach, we have selected a project from the hybridization between the

Social Education degree and the Industrial Engineering degree (2018-2019 academic year), namely the project to create a Smart Gym in a disused public space in the historic centre of Lleida (Spain). This social and technical proposal suggested using the kinetic energy generated by the users of this public gymnasium to illuminate the streets of the historic centre (Figure 1). This project, formed by three education and three engineering students, arose from the learning processes experienced in our hybrid teaching of both degrees and the set of connections, or 'assemblages', created by different practical activities, meetings and other experiences during the project.

Figure 1. Proposal for the Smart Gym. Source: The authors



Space chosen to install the Smart Gym



Machine management

2.1 Assemblages between the degree in Social Education and the degree in Industrial Engineering

Situating ourselves in a fluid and changing knowledge paradigm and in the theoretical school of social constructionism reveals this methodological approach to be something changing, enabling and hybrid. This emerged from the interaction between people and relating elements that seem unrelated, thus creating so-called assemblages, a concept devised by philosophers Deleuze and Guattari in *A Thousand Plateaus* (1987), where they describe the theory as a way of analysing social complexity, emphasizing the fluidity, interchangeability and multiple functionalities of different elements or features that are connected in society. This philosophical approach therefore allows us to comprehend teaching in higher education as a set of heterogeneous, connected 'things'. In such a view, the experience of teaching practice is constructed through the classroom space, the minds and bodies of students, and the computers they use, to mention just a few. In these networks, or assemblages, the relations between these elements are not stable or fixed but rather can be displaced and replaced within and among other elements.

Moreover, the concept of assemblage requires another philosophical concept, the rhizome, as coined by philosophers Deleuze and Guattari, who use this idea to describe how one element can connect with multiple elements. For these two philosophers,

"A rhizome has no beginning or end; it is always in the middle, between things, interbeing, intermezzo. The tree is filiation, but the rhizome is alliance, uniquely alliance. The tree imposes the verb "to be," but the fabric of the rhizome is the conjunction, "and... and... and..." (1987: 25).

Rhizomatic thinking opens infinite possibilities for approaching any thought, activity or concept. Understanding education and educational processes as rhizomes allows us to provide open, flexible and dynamic responses to the learning processes that emerge in teaching, as they enable new scenarios, many of which may seem inconceivable. One of these scenarios is the creation of hybrid spaces within university education. Theorized by Zeichner (2010), these break the dichotomy between theory and practice and between the knowledge created from academia and beyond, creating optimal conditions for the construction and application of knowledge.

In conclusion, understanding a methodological approach from the philosophical conception of assemblage and rhizome allows us to generate open, flexible and inclusive teaching practices. Placing ourselves in an emerging paradigm allows us to open our teaching practice to other fields of knowledge. The Smart Gym Project is an example of this, as it arose from the interactions between our students and the people who use and inhabit this marginal space. Presenting the concept of the rhizome and assemblage to this group allowed them to expand upon the possibilities of their proposal. This leads us to the second element of this approach, which is based on the interdisciplinary and transdisciplinary perspective that has emerged from these projects (Jové et al. 2018), bringing us closer to transversal humanism.

2.2. Transdisciplinary approaches in higher education

When one examines the evolution of knowledge, the fragmentation into specific disciplines led to deeper knowledge but discouraged a global perspective and an analysis of the interactions between different academic fields. As Morin affirms, "it is necessary to teach the methods that make it possible to apprehend the mutual relations and the reciprocal influences between the parts and the whole in the complex world" (2005: 2) and, therefore, to open horizons within the field of knowledge.

Such developments led to the emergence of a multi-disciplinary approach based on the non-integrative mix of several disciplines. However, the emergence of the systemic approach showed how the multidisciplinary perspective could not respond to all emerging problems. From such insight, interdisciplinary research emerged, which encompasses problems as a whole but views them from different disciplines. These investigations continued to develop and in the late 70s, UNESCO and the *Centre International de Recherches et Etudes Transdisciplinaires* advocated transdisciplinary research. Nicolescu argues that "transdisciplinarity concerns that which is at once between the disciplines, across the different disciplines, and beyond all disciplines. Its goal is the understanding of the present world, of which one of the imperatives is the unity of knowledge" (2010: 22).

At the same time, working through a transdisciplinary approach has allowed for dialogue between university disciplines, connecting knowledge, breaking and

changing the prejudices between the students of both degrees. A rigid, prejudiced and stereotyped positioning towards the other degree emerged in most groups during the first joint work sessions. The models, comments and mental constructions were highly visible and the group⁽²⁾ expressed this in stating that “at first we thought it was very strange to join with another discipline that is so totally different from ours. It is not normal”. However, being able to share views and work together for eight weeks within an interdisciplinary and transdisciplinary approach caused a change in opinion:

“Now, we see the other disciplines differently, since we have realized that we are not really totally opposed, and that other views are necessary in order to improve the way any problem is examined.”

“As we progressed, we saw how both disciplines have common ground on which to build this project, enriching us with different views and knowledge.”

Working through a transdisciplinary approach has allowed for dialogue between university disciplines, connecting knowledge, breaking and changing the prejudices between the students of both degrees

Such views show that awareness of academic dialogue is necessary between students of different disciplines, including those who have at first sight nothing in common, such as social education and industrial engineering. As teachers, it is our responsibility to create the conditions and contexts within university education to make this change of perspective happen. However, this can only happen if teachers are able to create these inter-transdisciplinary conditions. In this methodological approach, we are committed to breaking the boundaries between the two disciplines. This means creating educational experiences where communication between transdisciplinary contents emerges. As we have further noted in other research, using contemporary art and community resources further enhances such experiences, since such learning is a catalyst for possibilities and a strategy that enables rhizomatic thinking (O’Sullivan 2006).

2. The Smart Gym project is formed by Pau Becana, Eric Comellas, Guillermo Doste, Núria Pijoan, Irena Rius and Ingrid Simó.

2.3. Contemporary art as a catalyst for knowledge

The methodology of learning about contemporary art incorporates into teaching what the arts evoke and provoke. In this case, we view the use of contemporary art as an experience (Dewey 1934) that crosses the boundaries of art and allows us to reinterpret students’ ways of life. It is therefore valuable because of the variety of questions it generates, of its expressive richness and of the different scenarios that it evokes (Schön 1999; Stenhouse 1988; Jové 2013; Jové & Betrián 2012). In this methodological approach, we consider contemporary art as a catalyst for the rhizomatic possibilities that foster critical, imaginative, reflective and receptive individuals. Art, with its transdisciplinary nature, allows us to act like a scaffold in students’ learning process and as a model to help not to create dichotomies between theory and practice (Lenz-Taguchi 2010).

We believe that learning and communicating through contemporary art is a catalyst for possibilities and a strategy that enables rhizomatic thinking, offering the freedom to create the knowledge and understanding required to rethink education. As O’Sullivan (2006) and Allan (2012) state, contemporary art produces new and different possibilities of thinking about education, making alternative things happen, in a more inclusive way, while Adams, Worwood, Atkinson, Dash, Herne & Page (2008) point out that learning and communicating through art makes different things happen. This approach triggered us think of how contemporary art can be used to develop new methods of teaching and learning.

Learning and communicating through contemporary art is a catalyst for possibilities and a strategy that enables rhizomatic thinking, offering the freedom to create the knowledge and understanding required to rethink education

Hence, we go back to the year 2009, when a project developed by teachers from the Faculty of Education, Psychology and Social Work at the University of Lleida (Spain) created the exhibition space called Zona Baixa (Jové, Farrero, Betrián, Ayuso 2014). This space, located in the Faculty building, hosts works of contemporary art donated by the Panera Art Center, so that students can work with different artists, and so artists can loan their creations to students. It is from the relationship with the Panera Art Centre that a joint project arose between

education and engineering students with sound artist Agnès Pe in 2017-2018 and with artist and activist Daniel García Andújar in 2018-2019.

Specifically, the Smart Gym project worked with Daniel G. Andújar for two weeks, when this group of students were able to analyse the artist's creative process and his emphasis on the visibility of power relations in the city and how they shape our daily life. With Andújar's creative input, the students were able to extract new social discourses, raising awareness of invisible social practices to transform a disused space into a used and living one. This is how this group evaluated Andújar's participation in the project:

"Daniel Andújar allowed us to delve further into the cultural, social and power realities that exist in the historic centre of the city of Lleida. It helped us to link our work with cultural realities, as well as the different ways of seeing the current world."

This student highlights the change in the students' views after interacting with Daniel G. Andújar. If it had been another artist participating, the students would have surely followed a different creative process which would have led to other creative actions. Likewise, Andújar's contributions and his creative process had an impact on the teaching staff, inasmuch as this experience created new teaching resources to be used in the learning spaces (Jové 2017). This experience configured a different learning area, different to traditional learning spaces as it allows us to create novel, social and inclusive spaces.

2.4. Lived space as endless possibilities

Educational practices within higher education create and form part of society and the production of social space (Lefebvre 1991). Throughout history, space has been conceived as an inert and empty vessel waiting to be occupied by different bodies and objects. However, new currents of thought (Massey 2005; Soja 1996) argue that space must be comprehended as a continuous process produced by those who live in it. Space here is understood as a social construction, variable across history, created by the interaction between people and the physical environment. This perspective allows us to understand how the university is not a rigid entity, but is connected with other elements of society and the city in which it is situated, thus creating a network between different disciplines, professionals, historic places and learning contexts (Nora 1997; Lladonosa 2007; Vendrell 2008).

Thus, social space emerges from the unique interactions that take place in space. This is related to the aforementioned theory of social constructionism. For Lefebvre, "the social space "incorporates" social actions, the actions of both individual and collective subjects who are born and who die, who suffer and who act" (1991: 34). This allows us to understand how university teaching forms and is part of social space, which is a social product, since each society (each way of acting, of making a society) produces a space through its interactions. Space mediates and reflects society. In turn, this social space is shaped by bodies and senses that interact with it (Degen & Rose 2012). Focusing research on the dimensions of bodily and sensory experiences (objects, architectures and environments) provides a more holistic understanding of social life (Degen 2008).

Creating an awareness of the senses and the body in teaching has caused students to create new discourses in their research. As part of their learning, the students had to interact with a neighbourhood in Lleida and their projects emerged from the sensory ethnography that they conducted (Pink 2005). We could define sensory ethnography as that sociological practice based on collecting all information from space and through our perceptions. Being able to explore vistas, sounds, feelings and odours in the historic centre of the city of Lleida made it possible to discover dialogues and productions, and visualize the forms of life that inhabit it, thus enabling each group to focus their project on their own sensory ethnography. Specifically, the idea of a public gym emerged from this practice. As the students commented, "doing sensory ethnography opened the doors to new relationships and new discourses that we could never have imagined". So, this practice helped them to create their project by situating their own senses and bodies in a particular social space.

Focusing research on the dimensions of bodily and sensory experiences (objects, architectures and environments) provides a more holistic understanding of social life

2.5. Recommendations: Rhizomatic wanderings towards a new learning-teaching approach

This methodological approach shows how a teacher has built interactions between students from both degrees involving critical positioning and social responsibility. The results show how this methodological network

design helps to train creative, reflective and critical professionals. Such an approach allows university education to eliminate the fragmentation between disciplines, enriching and offering new learning contexts and new formats of university teaching. As Bauman (2005) says, education has to be liquid, since it must be flexible and dynamic enough to add to a world that is constantly changing.

3. Conclusions: to continue creating assemblages

We have shown how adopting an assemblage perspective provides teachers with a tool to transform their teaching through hybrid and heterogeneous practices that create new learning processes for students. Processes that allow for new approaches within teaching to connect seemingly opposing disciplines. Such an approach makes it possible to relate elements that at first sight seem disconnected, deepen the contents of the students' projects and challenge the stigmas and prejudices that students might have towards other disciplines.

We have used a transdisciplinary approach to rethink the concept of education and teaching practice. We deliberately fostered transdisciplinary learning situations that are based on research and action in and of the surrounding urban environment. This approach allows the contents of the curriculum to circulate throughout the different learning contexts that students experience during their degree, thus allowing us to learn through social spaces. It also leads the diversity, interactions and new narratives that emerge in these spaces to enrich the learning and content of the curriculum. We should note that working between different forms of knowledge has involved confrontation between students' different thought paradigms. However, the scaffolding technique and mediation by teachers led students to reach agreements.

As we have seen, working with contemporary art and creative processes is a strategy to give projects a different look. It allows the reconfiguration of both the projects conducted by students and our own teaching practice. In this case, the thoughts and ideas that emerged from learning and communication through contemporary art defined the teaching. Therefore, as teachers, we fostered projects that are viewed as an artistic process, where creativity is not at the service

of neoliberalism. Kalin (2016) warns us of the dangers in contemporary education of only fostering creativity to increase the economy through business innovation. In our case, we seek a re-appropriation of creativity to engender learning conditions that favour an ecological and sustainable education.

Through our approach, the creativity of transdisciplinarity projects involving social educators and industrial engineers arose from the voices and everyday practices that make up the social space in the city of Lleida. We believe an education curriculum must be questioning, critical and cooperative, and needs to integrate multiple areas of knowledge, based upon coherent, real-life 21st-century scenarios and a commitment to transversal humanism.

References

- Adams, J., Worwood, K., Atkinson, D., Dash, P., Herne, S. & Page, T. (2008). *Teaching through contemporary art: a report on innovative practices in the classroom*, London: Tate Publishing.
- Allan, J. (2012). Thinking again about inclusion. *Perspektiver i barnehagefaglige praktiser (Including. Perspectives in kindergarten practice)*. Oslo: Universitetsforlaget.
- Bauman, Z. (2005). Education in Liquid Modernity. *The Review of Education, Pedagogy and Cultural Studies*, 27, pp. 303-317.
- Berger, P., & Luckmann, T. (1966). *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. New York: Penguin Books.
- Degen, M. (2008). *Sensing Cities*. Abingdon, UK: Routledge
- Degen, M. and Rose, G. (2012). The Sensory Experiencing of Urban Design: The Role of Walking and Perceptual Memory. *Urban Studies*, 49, pp. 3271-3287.
- Deleuze, G., & Guattari, F. (1987). *Mil mesetas: Capitalismo y esquizofrenia*. Valencia: Pre-textos.
- Jové, G. (2013). «Artistry» en formación de maestros y la docencia como arte. In *Actas del Simposio Internacional Aprender a ser docente en un mundo de cambio* (Barcelona 21-22 November), Barcelona.
- Jové, G., & Betrián, E. (2012). Entretejiendo encajes entre la universidad, los centros de arte y las escuelas, *Arte, individuo y sociedad*, 24(3), pp. 301-314.

- Jové, G.; Farrero, M.; Betrián, E.; Ayuso, H. (2015). Zona Baixa. Apropiacions pedagògiques de contextos en desús (ID 281), *Revista del Congrés Internacional de Docència Universitària i Innovació (CIDUI)*, 2.
- Jové, G. (2017). *Maestras contemporáneas*. Lleida: Edicions de la Universitat de Lleida.
- Jové, G., Bonastra, Q., Gutiérrez-Ujaque, D., Sebastian-Novell, C. (2018). L'art contemporani, els relats autobiogràfics i els espais híbrids com a experiències innovadores en l'aprenentatge: Una triangulació metodològica (SM6). *Revista del Congrés Internacional de Docència Universitària i Innovació (CIDUI)*, 4.
- Kalin, N. (2016). We're all creatives Now: Democratized Creativity and Education. *Journal of the Canadian Association for Curriculum Studies (JCACS)*, 13(2), pp. 32-44.
- Kuhn, T. (1962). *La estructura de las revoluciones científicas*. Mexico: University of Chicago Press.
- Lefebvre, H. (1991). *The Production of Space*, Oxford: Blackwell.
- Lenz-Taguchi, H. (2010). *Going beyond the theory/practice divide in Early Childhood. Introducing and intra-active pedagogy*, London: Routledge.
- Lladonosa, J. (2007). *Els carrers i les places de Lleida a través de la història*, Lleida: Ajuntament de Lleida.
- Massey, D. (2005). *For Space*. London: SAGE Publications Ltd.
- Morin, E. (2005). *Enseñar a vivir: Manifiesto para cambiar la educación*. Buenos Aires: Ediciones Nueva Visión.
- Nicolescu, B. (2010). Methodology of transdisciplinarity – levels of reality, logic of the included middle and complexity. *Transdisciplinary Journal of Engineering & Science*, 1(1), pp. 19-38.
- Nora, P. (Ed.) (1997). *Les lieux de mémoire*, Paris: Gallimard, 3 vols.
- O'Sullivan, S. (2006). *Art encounters Deleuze and Guattari: Thought beyond representation*, London: Palgrave Macmillan.
- Saéz, F. (2018). *Populisme: El llenguatge de l'adulació de les masses*, Barcelona: Publicacions de l'Abadia de Montserrat.
- Schön, D. (1991). *The reflective Practitioner*, London: Arena.
- Soja, E. (1996). *Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places*. Malden, Massachusetts: Blackwell Publishers Inc.
- Stenhouse, L. (1988). Artistry and Teaching. The teacher as focus of research and development. *Journal and Curriculum of supervision*, 4(1), pp. 43-51.
- Vendrell, E. (2008). *Fonts, pous i aljubs... i aixetes. La distribució d'aigua potable a Lleida, dels inicis a l'actualitat*, Lleida: Ajuntament de Lleida.
- Zeichner, K. (2010). New epistemologies in teacher education. Rethinking the connections between campus courses and practical experiences in teacher education at the university. *Interuniversity Journal of Teacher Education*, 68 (24.2), pp. 123-150.

Robotics and Artificial Intelligence Meet the Humanities: Some Initiatives for Ethics Education and Dissemination

Carme Torras

Abstract

The influence of the humanities on the study of a technological subject like robotics needs to rapidly grow, for the simple reason that robotics is becoming a part of humanity: assisting, interacting, and enabling people in an increasing number of ways in daily life. The robotics research community is well aware of the need for such a crossover with the humanities and many joint ventures are being undertaken, such as forums on “Robotics meets the Humanities” at main robotics conferences, the launching of research projects, and the publication of special issues in scientific journals. This cross-cutting has even led to a new discipline: Roboethics, a subfield of applied ethics studying both the positive and negative implications of robotics for individuals and society, with a view to inspire the moral design, development and use of so-called intelligent/autonomous robots, and help prevent their misuse against humankind. The discipline involves two main areas: legal regulation and ethical education. Regarding the former, institutions such as the European Parliament, the South Korean Robot Ethics Charter, the IEEE Standards Association, and the British Standards Institution are developing regulations for robot designers, programmers, and users. There are many options to integrate ethics education (or Humanities) in technological university degrees, ranging from including a professional ethics course in the syllabus, to allowing students to take certain credits or a minor in a Humanities Department, to even offering a combined degree, like the Computer Science and Philosophy degree at the University of Oxford. Prestigious associations such as IEEE and ACM include 18 knowledge areas in their Computer Science curricula, one of which is “Social Issues and Professional Practice”, so that “students develop an understanding of the relevant social, ethical, legal and professional issues”. To this end, some courses in this area recur to science fiction to exemplify conflictive situations, since narrative is a good way to engage students in safe discussion

and reasoning about difficult and emotionally charged issues without making it personal. Some experiences along this line will be described.

Introduction

The influence of the humanities on the study of technological subjects —such as robotics, biomedical engineering, artificial intelligence, data science and biotechnology, to name just a few— needs to grow rapidly, for the simple reason that these technologies are becoming a part of humanity: assisting, interacting, and enabling people in an increasing number of ways in daily life.

Although computer and robotic technologies are often considered a further step in a social transformation that started with the agricultural and industrial revolutions, they introduce a qualitative difference. It is no longer only a matter of mechanizing heavy and repetitive tasks on farms and in industries, or electrical appliances freeing up people’s time for use in more creative and enjoyable ways. The difference lies in the fact that these new technologies enter domains so far considered exclusively human, such as decision-making, emotions, and social relationships, which may compromise human values, decisively shape society and our way of life, and ultimately influence the evolution of humankind.

Thus, the trend towards more and more specialization that has dominated higher education in recent decades needs to be somehow counteracted by adopting a wider view that takes into consideration the social implications of the technologies being studied. For example, prestigious associations such as the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE) include 18 knowledge areas in their Computer Science curricula (ACM/IEEE CS curricula 2013), one of which is “Social Issues and Professional Practice”, so that “students develop an understanding

of the relevant social, ethical, legal and professional issues". The need to incorporate the study of these non-technical issues into the ACM curriculum was formally recognized in 1991.

The trend towards more and more specialization that has dominated higher education in recent decades needs to be somehow counteracted by adopting a wider view that takes into consideration the social implications of the technologies being studied

Researchers and professionals in these technological areas are also becoming aware of the importance of joining forces with social scientists, lawyers, philosophers and anthropologists, among other humanities scholars, and interdisciplinary teams are becoming more and more common practice as well as being much appreciated. Therefore, having a cross-disciplinary engineering education, which permits bridging language gaps with professionals from other fields and different backgrounds will increasingly be a key feature of a successful career. Using theoretical frameworks from education and psychology to ground the results of an experimental study with 24 individuals, Borrego and Newswander (2008) provide some recommendations for funding agencies, professional societies, university administrators and faculty to promote cross-disciplinary engineering education.

Technological degrees open up to the Humanities

There are many options to integrate contents from the humanities in technological university degrees, ranging from including a course on good professional practice in the syllabus, to allowing students to take some credits or a minor in a Humanities Department, to even offering a mixed degree, like the Computer Science and Philosophy degree recently launched at Oxford University⁽¹⁾, which focuses on common interests in artificial intelligence, logic, robotics, virtual reality, and ethics.

It is unsurprising and most desirable that, among humanities subjects, ethics receives a prominent place on the syllabus, as it explains how human values relate

to lifestyles, and how digital technologies are already having a strong impact on our daily lives and are thus shaping the most important human values.

Several universities in Europe, and many in the USA and Canada, offer undergraduate courses related to Ethics in Technology, the Digital Age, Society and Technology, etc., which, following the above-mentioned ACM/IEEE Computer Science curricula, address issues like privacy, intellectual property, safety, reliability, autonomous and pervasive technologies, vulnerable groups, and professional ethics. Such courses are not only offered in Computer Science and Engineering degrees, but are often taught in Philosophy departments as well.

A typical situation is that at the University of the West of England in Bristol, where the syllabus of the Robotics BEng degree includes a compulsory course on Ethics of Technology taught in the Philosophy department.

Among the universities regularly offering courses related to technology ethics are those of Bristol, Leeds, Sheffield, Oxford, Twente, Genoa, Pisa, Barcelona Tech, Stanford, Carnegie-Mellon, Yale, Southern California, California Santa Barbara, California Polytechnic, Georgia Tech, Texas Tech, Notre Dame, Miami, Southern New Hampshire, Lower Massachusetts, Worcester Polytechnic, Illinois, British Columbia, Carleton, Ottawa and Dalhousie, to name but a few.

Information on similar programs in other continents is scarcer. Seoul National University offers ethics courses tailored to almost every major, as well as core courses on "Information Society and Cyberethics" and "Engineering Ethics and Leadership". Japanese and Australian universities have similar programs. The Japanese ministry of education and science is funding a project on "the construction of robot ethics according to the practical interest of roboticists", which should establish education guidelines on robot ethics. Another unique example is Queensland University of Technology in Brisbane, which offers an online Robotics course (the popular MOOCs), where one of the 12 topics covered is "Robots in society and associated ethical issues".

In short, there is a clear need to include focused and practical ethics courses on Technological curricula. Computer Science degrees have played a pioneering role in this regard, and several universities are already offering ethics courses on such degrees. Given the fast expansion of digital technologies, AI, bioengineering, social robotics, and similar subjects, it is envisaged

1. <http://www.ox.ac.uk/admissions/undergraduate/courses-listing/computer-science-and-philosophy>

that technology ethics courses will soon proliferate not only in Computer Science, Electrical Engineering and Philosophy curricula, but will also percolate to related disciplines in the social and natural sciences.

An Experience: Robotics Meets the Humanities

The robotics research community is well aware of this need for confluence with the humanities and many joint programs have been set up, such as the launch of research projects (euRobotics 2012; RoboLaw 2014), the publication of special issues of scientific journals (Veruggio et al. 2011), and the organization of open forums on “Robotics meets the Humanities” at the main robotics conferences (ICRA Forum 2013; IROS Forum 2018).

These forums are often open to the general public and gather as invited speakers not only university professors from technical and humanities departments, but also filmmakers, science-fiction writers, dancers, stage performers, and representatives from Governmental institutions, all with a common belief that robotics development must take into account our understanding of humanity in its multiple facets.

The view I presented at those forums of how bridges between robotics and the humanities may be tended is pictured in Figure 1. Both disciplines share a modeling level aimed at discovering facts and relationships, and scholarly work by joint teams is beginning that relates physical models developed by roboticists to psychological and social models studied in the social sciences. Moreover, as exemplified in the aforementioned forums, bridges can also be established at an artistic level by joining the creative sides of both robotics and the humanities, namely technological innovation and science fiction, respectively.

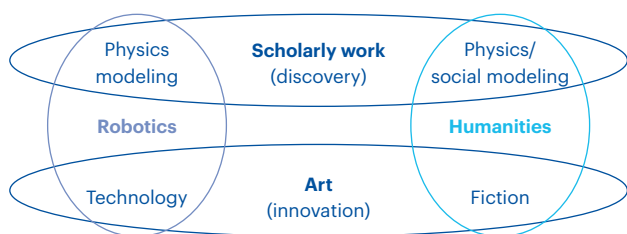
For example, in 2012 the Center for Science and the Imagination was set up at Arizona State University⁽²⁾. The

idea came from a thought-provoking speech by Neal Stephenson (2011), given in the presence of the university president, in which the writer stated that today’s scientists had lost the ability to think and do “great things”, like those that had previously inspired the Apollo space program or the microprocessor. The president responded that perhaps it was science-fiction writers who were at fault because they were failing to evoke an ambitious future that would inspire scientists to make it come true. As a result, the center now houses several research groups that bring together researchers in science and humanities to devise and endeavor to achieve ambitious goals that shape the future.

One of the projects run by the Center is the continuation of a program launched by the Intel company, *The Tomorrow Project*, in which they asked four science-fiction writers to create stories picturing possible future uses of its products in photonics, robotics, telematics and smart sensors. The book containing the four accounts is open access (Rushkoff et al. 2012), and several volumes have appeared since then in which solutions are proposed to the greatest challenges facing humanity today, through the visual arts and writing, all as a result of the work carried out at this center.

The confluence of robotics with the humanities has even resulted in a new discipline: Roboethics, a subfield of applied ethics studying both the positive and negative implications of robotics for individuals and society, with a view to inspiring the moral design, development and use of so-called intelligent/autonomous robots, and help prevent their misuse against humankind (Veruggio 2005). The discipline involves two main areas: legal regulation and ethical education. Regarding the former, several institutions and professional associations are developing regulations for robot designers, programmers and users. The European Parliament (2017) released some guidelines under the general title of *Civil Law Rules on Robotics*. Other examples are those put forth by the British Standards Institution (2016) and the IEEE Standards Association (2019).

Figure 1. Graphic representation of possible bridges between Robotics and the Humanities.



The confluence of robotics with the humanities has even resulted in a new discipline: Roboethics, a subfield of applied ethics studying both the positive and negative implications of robotics for individuals and society

2. <http://csi.asu.edu/>

Concerning education, although Roboethics is touched upon in most courses dealing with ethics in technology and the digital society, I am only aware of a few ethics courses devoted entirely to robots. I would highlight those in the Philosophy departments of Carleton and Notre Dame universities, and those in the Computer Science departments of Carnegie-Mellon (available online) and Illinois-Springfield (an online course as well, fulfilling the Engaged Citizenship Common Experience requirement). In Europe, some such courses are also offered at Delft University of Technology, the University of the West of England in Bristol, and Oslo University, among others.

Given the rapid expansion of social robotics and intelligent systems, it is envisaged that Roboethics courses will soon proliferate in Computer Science, Engineering and Philosophy curricula, and then percolate to related disciplines in the social and natural sciences.

Ethics courses for technologists based on science fiction

The teaching of professional ethics differs considerably from teaching other subjects on a technological degree. It is not so much a matter of students learning some specific contents, but one of making them aware of the social and ethic implications of their future jobs and training them to analyze and debate such issues. People hold multiple and often conflicting sets of values and the aim is not to unify students' views around a set of rules, but to raise their awareness and abilities to think and discuss. Moreover, technology students are not philosophers. Although there are some consolidated ethical theories that they should know about, philosophical texts are often too abstract for computer scientists and engineers, and a pragmatic option is usually taken.

According to Sullins (2015), the main ethical theories relevant to digital technologies are: consequentialism or utilitarianism (maximizing the number of people that enjoy the highest beneficial outcomes), deontologism (acting only according to maxims that could become universal laws), virtue ethics (relying on the moral character of virtuous individuals), social justice (all human beings deserve to be treated equally and there must be a firm justification in case of mistreatment), common goods (living in a community places constraints on the individual), religious ethics (norms come from a

spiritual authority), and information ethics (policies and codes for governing the creation, organization, dissemination, and use of information).

Since no single theory is appropriate for addressing all ethical issues arising in the design and use of technical innovations, the pragmatic option is to adopt a hybrid approach. Such hybrid ethics are advocated by Wallach and Allen (2008) as a combination of top-down theories (i.e., those applying rational principles to derive norms) and bottom-up ones (i.e., those inferring general guidelines from specific situations).

Now, where should these specific situations come from? Stephenson (2011) claims: "What science fiction stories can do better than almost anything else is to provide not just an idea for some specific technical innovation, but also to supply a coherent picture of that innovation being integrated into a society, into an economy, and into people's lives." Thus, some Ethics in Technology courses recur to science fiction stories to exemplify conflictive situations. Themes addressed in the classic works by Asimov, Dick, Bradbury, Orwell, Huxley, Hoffman, Shelley, Capek, Wells, Sturgeon, Silverberg, or Keyes, such as the three laws of robotics, robot nannies, security versus freedom, lack of privacy, technological totalitarianism, emotional surrogates, humanoid replicas, incidence on the job market, moral responsibility, loss of human control, high-tech biases, manipulation and automation divides, or human enhancement and posthumanism, have attained major relevance with the development of social robots and artificial intelligence.

Since no single theory is appropriate for addressing all ethical issues arising in the design and use of technical innovations, the pragmatic option is to adopt a hybrid approach

Given this relevance, it is only natural for instructors teaching Ethics on technological degrees to be recurring to such science fiction stories to exemplify sensitive situations that the students may face in their professional practice, so as to foster fruitful reflection and debate on these matters. After teaching the course "Science Fiction and Computer Ethics" five times at the University of Kentucky and twice at the University of Illinois at Chicago, Burton et al. (2018) state on their experience: "Using fiction to teach ethics allows students to safely discuss and reason about difficult and emotionally charged issues without making the discussion personal." Besides highlighting how engaging

narrative is for students, the authors report on many positive insights they received along the years, and they are worth reading in detail.

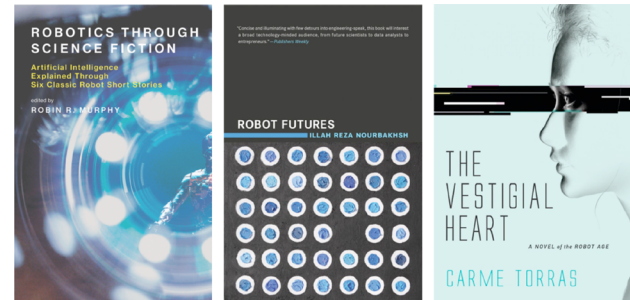
Modern science fiction touches upon many of the ethical issues depicted in classical stories, but usually focuses on the more specific concerns raised by new technologies. Not only novels and short stories, but also recent movies and TV series delineate ethically-sensitive situations with considerable depth and rigor. Such is the case of series like *Real Humans* and *Black Mirror*, which could trigger highly elaborate and even scholarly debate, as well as films like *Blade Runner 2049*, *Surrogates* and *Robot and Frank*. In fact, the latter is being used in the Teach with Movies (2012) platform as a guide for a high-school course on Robot Ethics.

In an academic context, Iverach-Brereton (2011) reviews the roles played by robots in movies from a historical perspective, paying special attention to their degree of autonomy, and uses such fictional scenarios as a tool to make predictions about how humans may or may not accept robot integration into society. Similarly, El Mesbahi (2015) explores ethical issues related to human-robot interaction through the lens of thirty popular sci-fi movies, and presents the results of a survey about how people perceive robots in those movies and who they feel is responsible for their actions, namely the robot itself, the designer/manufacturer, the programmer or the user.

Turning to books specifically designed to teach courses on technological degrees based on science fiction, I would highlight Murphy (2018), Nourbakhsh (2013) and Torras (2018); see Figure 2. The one edited by Murphy is intended to explain key principles of artificial intelligence; the enclosed stories —by I. Asimov, V. Vinge, B. Aldiss, and Ph. K. Dick— cover telepresence, behavior-based robotics, deliberation, testing, human-robot interaction, the “uncanny valley,” natural language understanding, machine learning, and ethics. Each story is preceded by an introductory note, “As You Read the Story,” and followed by a discussion of its implications, “After You Have Read the Story.”

The other two books differ from this one in two respects: i) the authors themselves wrote the science fiction stories used for illustration, and ii) the books do not explain technical principles, but are explicitly intended to foster debate on the social and ethic implications of information and communication technologies.

Figure 2. Three books published by MIT Press specifically designed to teach courses on technological degrees based on science fiction.



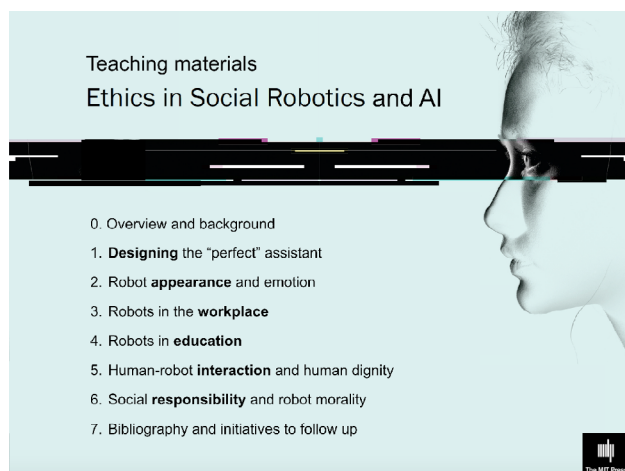
By drawing possible future scenarios, Nourbakhsh (2013) raises some concerns about where we are heading, without either taking a regulatory ethics viewpoint or explicitly trying to be pedagogical. The author, a renowned roboticist, makes very lucid remarks by concentrating on the following specific topics: marketing strategies on the web; the consequences of non-ephemeral design; flying robotic toys that operate by means of “gaze tracking”; robot-enabled multimodal, multicontinental telepresence; and even a way that nanorobots could allow us to assume different physical forms. Nourbakhsh examines the underlying technology and the social consequences of each scenario. He also offers a counter-vision: a robotics designed to create civic and community empowerment.

Because of my research on assistive robotics (Torras 2016, 2019), I became progressively concerned about the social and ethical implications of the technologies we are developing and especially interested in devising ways to teach Ethics to technologists. This led me to try my hand at fiction, and in the novel *The Vestigial Heart* (Torras, 2018), I imagined how being raised by artificial nannies, learning from robotic teachers and sharing work and leisure with AI programs would affect the intellectual, emotional and social habits of future generations. The novel’s *leit motiv* is a quotation from the philosopher Robert C. Solomon (1977): “it is the relationships that we have constructed which in turn shape us.” He meant human relations with our parents, teachers and friends, but the quotation can be applied to robotic assistants and all sorts of interactive devices, if they are to pervade our lives.

Following a suggestion by MIT Press Editor Marie L. Lee, an appendix with 24 ethics questions and hints for a discussion around the situations appearing in the novel was included in the book, and published together with an online teacher’s guide and a 100-slide presentation to deliver a course on *Ethics in Social Robotics and Artifi-*

cial Intelligence (see Figure 3). It covers six major topics: how to design the ‘perfect’ assistant; the importance of robot appearance and the simulation of emotions for the acceptance of robots; the role of AI programs in the workplace and in educational environments; the dilemma between automatic decision-making and human freedom and dignity; and civil responsibility related to programming ‘morals’ in robots.

Figure 3. Cover of the 100-slide presentation and chapters in the teacher’s guide to a university course on Ethics in Social Robotics and Artificial Intelligence, downloadable as free ancillary materials from the MIT Press website: <http://mitpress.mit.edu/books/vestigial-heart>



Each section in the teacher’s guide follows the same structure, starting with some highlights from the novel, then the corresponding ethics background is provided, followed by four questions and hints for their discussion, and closing with some revisited issues from previous chapters. The book, together with the ancillary ethics materials, has been used to teach an entire Ethics in Technology course and for some sessions at several universities, mainly in Spain and USA so far, but some European universities have already expressed an interest in doing likewise in the coming academic terms.

Concluding remarks

The increasing interaction of people with all sorts of devices and AI programs in everyday life poses important social and ethical challenges with a lot of potential to substantially shape our future. This calls for technical university degrees to get closer to the humanities, so that students become aware of possible sensitive issues they may face in their future careers and learn to reflect on and discuss these matters.

Philosophy, psychology, social sciences, and law are providing perspectives and prior knowledge to deal with these issues, while science fiction permits free speculation on potential scenarios and the role humans and machines may play in the *pas de deux* that irredeemably connects us. Along this line, educational materials based on science-fiction (SF) stories have proven highly effective in engaging technology students taking ethics courses (Burton et al. 2018).

This growing need for practical and engaging ethics courses on Engineering and Computer Science curricula, recognized in the USA several years ago, is now rapidly spreading to other countries, particularly in Europe, and to related disciplines as well. Several syllabi relying on both ethics texts and classical SF stories are being proposed and the corresponding courses will be taught at more and more universities worldwide in the coming years.

Here we have described three recent proposals by researchers in AI and robotics: one book using classical stories to explain computational principles, and two books relying on modern science fiction to convey technoethics knowledge, with the unique characteristic that the fiction was written by the researchers themselves in order for the stories to accurately illustrate the issues to be discussed, in addition to making the material pedagogically appealing to technology students, instructors, and also possibly general readers interested in these amazing future perspectives.

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References

- ACM/IEEE CS Curricula. (2013). Curriculum Guidelines for Undergraduate Degree Programs in Computer Science. https://www.acm.org/binaries/content/assets/education/cs2013_web_final.pdf
- Borrego, M. and Newswander, L.K. (2008). Characteristics of successful cross-disciplinary engineering education collaborations. *Journal of Engineering Education*, 97(2), pp. 123-134.
- British Standards Institution. (2016). Robots and robotic devices. Guide to the ethical design and application of robots and robotics systems. Online: <https://shop.bsigroup.com/ProductDetail/?pid=000000000030320089>
- Burton E., Goldsmith J. and N. Mattei. (2018). How to teach computer ethics through science fiction. *Communications of the ACM*, 61(8), pp. 54-64.
- El Mesbahi M. (2015). Human-Robot Interaction Ethics in Sci-Fi Movies: Ethics Are Not 'There', We Are the Ethics! Intl. Conference of Design, User Experience, and Usability, *Lecture Notes in Computer Science*, 9186, pp. 590-598.
- euRobotics project. (2012). Deliverable D3.2.1 - Ethical Legal and Societal issues in Robotics. http://www.eurobotics-project.eu/cms/upload/PDF/euRobotics_Deliverable_D.3.2.1_ELS_IssuesInRobotics.pdf
- European Parliament. (2017). Civil Law Rules on Robotics. Online: [http://www.europarl.europa.eu/RegData/etudes/PERI/2017/580862/IPOL_PERI\(2017\)580862_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/PERI/2017/580862/IPOL_PERI(2017)580862_EN.pdf)
- ICRA Forum. (2013). Robotics Meets the Humanities. <http://www.icra2013.org/indexaf5b.html>
- IEEE Standards Association. (2019). The Global Initiative on Ethics of Autonomous and Intelligent Systems. https://standards.ieee.org/develop/indconn/ec/autonomous_systems.html
- IROS Forum. (2018). Robotics meets the Humanities: Social Relationship, Ethics, Art and Science Fiction. <http://www.ynl.t.u-tokyo.ac.jp/forum/iros2018/>
- Iverach-Brereton C. (2011). Learning from the Future: What Science Fiction Can Teach Us about Social Robots. *Advanced Introduction to Human Robot Interaction (AHRI 2011)*, University of Manitoba, Winnipeg, Canada.
- Murphy R. (ed.) (2018). *Robotics Through Science Fiction: Artificial Intelligence Explained Through Six Classic Robot Short Stories*. MIT Press.
- Nourbakhsh I.R. (2013). *Robot Futures*. MIT Press. Cambridge, Massachusetts.
- RoboLaw project. (2014). Deliverable D6.2 - Guidelines on Regulating Robotics. Online: http://www.robolaw.eu/RoboLaw_files/documents/robolaw_d6.2_guidelinesregulatingrobotics_20140922.pdf
- Rushkoff D., Hammond R., Thomas S., Markus H. (2012). *The Tomorrow Project*. Bestselling Authors Describe Daily Life in the Future. Intel. Santa Clara.
- Solomon R.C. (1977). *The Passions*. New York: Anchor Press / Doubleday.
- Stephenson N. (2011). Innovation starvation. *World Policy Journal*, 28(3), pp. 11-16. Online: <http://www.worldpolicy.org/journal/fall2011/innovation-starvation>
- Sullins J.P. (2015). Applied professional ethics for the reluctant roboticist. In *The Emerging Policy and Ethics of Human-Robot Interaction*, edited by L.D. Riek, W. Hartzog, D. Howard, A. Moon and R. Calo, Workshop at the 10th ACM/IEEE International Conference on Human-Robot Interaction, Portland.
- Teach with Movies. (2012). Robot Ethics Using Clips from *Robot and Frank*. <http://teachwithmovies.org/robot-and-frank/>
- Torras C. (2016). Service robots for citizens of the future. *European Review*, 24(1), pp. 17-30.
- Torras C. (2018). *The Vestigial Heart. A Novel of the Robot Age*. MIT Press. Cambridge, Massachusetts. (A teacher's guide and a 100-slide presentation are provided as free ancillary materials for instructors: <http://mitpress.mit.edu/books/vestigial-heart>)
- Torras C. (2019). Assistive robotics: Research challenges and ethics education initiatives. *DILEMATA: International Journal of Applied Ethics* (30) pp. 63-77.
- Veruggio G. (2005). The birth of roboethics. Roboethics Workshop at the IEEE Intl. Conf. on Robotics and Automation, Barcelona.
- Veruggio, G., Solis, J. and Van der Loos, M. (2011). Roboethics: Ethics applied to robotics [from the guest editors]. *IEEE Robotics and Automation Magazine*, 18(1): pp.21-22.
- Wallach W. and Allen C. (2008). *Moral machines: Teaching robots right from wrong*. Oxford University Press.

Humanities in Medical Teaching: a Passing Fad or a Sound Need?

Josep E. Baños, Irene Cambra-Badii, Elena Guardiola

Abstract

The advancement of science and technology in the twentieth century has exacerbated the feeling that the humanities are useless for the training of professionals from pure and applied scientific backgrounds. The development of scientific medicine and the therapeutic advances of the last two centuries shifted many physicians' focus from the patient to the disease. In recent decades, the success of evidence-based medicine and the increasing availability of technology have exacerbated this situation. One of the most important consequences of this scenario has been the deterioration of the doctor-patient relationship, as many patients believe that their physicians are interested only in their disease and not in their own feelings. Concerns have been raised about the need to 'humanize' medicine by recovering the role of physicians as professionals who take care of patients in a broader sense. One essential step toward attaining this goal is to educate medical students in the values of professionalism. Introducing the humanities to medical education could enhance students' understanding of sick patients and thus complement their knowledge of the underlying biological processes. We need to convince medical instructors that literature, visual arts, history and philosophy can help students understand patients' feelings about their diseases better. The humanities are not merely a specious adjunct to medical training; including them in medical curriculums will help ensure more empathic physicians who treat patients as well as diseases.

Medicine and Humanities: the History of a Long Divorce

Medicine and the humanities are two disciplines that share the same interest: the human being, although there are certainly some important differences regarding their ultimate objectives and their epistemological

approaches. Medicine is mainly interested in the interaction between humans and disease, and ways to avoid illnesses and to allay and cure them when they appear. Since the nineteenth century, medicine has used the so-called scientific method to empirically find the actual causes of diseases and to evaluate the effectiveness of diagnostic and therapeutic approaches. This is done using a definite doctrinal body that most physicians accept and apply to a restricted number of subjects. In fact, this is an example of Kuhn's well-known theory of paradigms (1962), in the sense that it uses a shared belief to achieve a common objective. In contrast, the humanities are more about interpretative methods. They involve a group of miscellaneous disciplines that are not oriented towards a single common objective. From an epistemological point of view, the humanities' method for approaching knowledge is personal experience based on subjective approaches. From this analysis, we can conclude that two very different ways of analysing human beings are used. They are so different that any kind of liaison between them seems impossible, and many members of both communities accept this as an undisputable truth. However, this conceptual and working divide has not always been so clearly established.

Medicine and the humanities are two disciplines that share the same interest: the human being

We could start by considering ancient civilizations, in times when medicine was closely related to magic and religion. Before Greek medicine appeared, disease was considered to be the consequence of devils entering the human body. Therefore, religious leaders were considered the best physicians, as they were so skilled at expelling demons by means of magical procedures. In Judaism, disease was viewed as a consequence of sinful behaviours, and the sick could only be cured if they recognised their sins. Consequently, magic, religion and medicine were intimately related. This changed in Ancient Greece, where a scientific doctrine was built that was far-removed from magic and religion.

Hippocrates' theories created a new way to understand diseases, although the pathophysiology based on the four humours might seem candid and futile today (Ackerknecht, 1982). However, this epistemological approach was very important because for the first time, medicine was built on scientific grounds. Another important characteristic of Ancient Greek science was the existence of a unity of knowledge. Philosophy and science were not considered strictly different disciplines, and Plato and Aristotle had their own theories about the body and the soul (Van der Eijk, 2013).

Over the following centuries ruled by the Roman Empire, Greco-Roman culture was the most prominent in Western Europe, even after the collapse of Rome in the fourth century A.D. The belief that a full education required both scientific and humanistic disciplines was undisputed. At early medieval universities, students learned the *Trivium* and *Quadrivium* before starting the specific subjects of Canonical or Civil Law, Medicine or Theology. *Trivium* included Grammar, Logic and Rhetoric, whereas the disciplines of the *Quadrivium* were Arithmetic, Astronomy, Music and Geometry (Watson, 2009). This reflected the importance of humanistic and scientific subjects in the education of college students at that time.

In the following centuries, science underwent major development, especially in mathematics and physics during the seventeenth century, and chemistry in the nineteenth century. The complexity and richness of the new discoveries led to the specialization of scientific fields. The experimental method was considered the only paradigm for answering scientific inquiries and obtaining real knowledge. Activities that lacked such an approach, such as philosophy and literature, were deemed speculative and therefore useless for pure or applied scientists. To understand this view, we could look at psychology. This discipline had always been considered a form of intellectual speculation until experimental psychology appeared in the early twentieth century. However, in some countries, like Spain, psychology was taught at schools of humanities for many years, and its value for understanding human behaviour was only recognized when it embraced the scientific method that was so popular at schools of science and medicine.

In the last decades of the twentieth century, there were staggering advances in scientific and technological disciplines. One collateral effect of this success has been

the idea that the humanities are of minimal value for the education of young people. Some authors, such as Martha Nussbaum in *Not for profit: why democracy needs the humanities* (2010) and Nuccio Ordine in *L'utilità dell'inutile* (2013) have recently challenged this belief and proposed the need for and value of all students studying humanities.

Medicine followed the same path as the pure sciences. Until the mid-1800s, it was an observational and highly speculative discipline, but this changed quickly with the use of mathematics, physics and chemistry to understand human physiology and the ways that illnesses work. Authors like William Osler described the important value of humanities in the training of medical students and improving clinical practice (Osler, 1932), but his advice went almost unheeded in the first half of the twentieth century. The therapeutic revolution that followed the discovery of antibiotics in 1940s meant physicians could effectively improve, and even cure, many diseases for the first time in human history. Why bother with literature, music or visual arts? In the best of cases, these were no more than entertainment and there were no medical benefits to be gained from their knowledge or use in patients. Medicine was considered a scientific discipline that did not need the humanities at all. The *scientolatry* school of thought, so prevalent in those times, also impregnated medicine. However, the situation started to change in the late 1950s and, paradoxically, as a consequence of an important technological discovery that would be applied to medicine.

Medicine meets moral philosophy to make adequate choices on clinical issues

Ethics has a long relationship with medicine. It is accepted that Thomas Percival's *Medical Ethics*, published in 1803 (Percival, 1803), was the first book to analyse the moral compromises implied in medical practice. Even when the development of experimental medicine supposed the use of human beings in research, this was not considered a problem that merited any attention. Since the Hippocratic Oath, it had been felt that physicians should choose the best options for their patients and this included their participation in medical research.

Their authorization for any medical procedure was rarely sought, as physicians simply decided what was best for them. Even though beneficence and non-maleficence principles were applied in most cases, avoidance of the principle of autonomy presented the possibility of abuse by some medical practitioners. The world would later learn this in a painful way.

Since the Hippocratic Oath, it had been felt that physicians should choose the best options for their patients and this included their participation in medical research

The end of the Second World War revealed the awful use of prisoners for supposed research purposes in Nazi concentration camps and also by the Japanese, such as Unit 731 in Manchuria (Annas and Grodin, 1992 and Porter, 1998). The lack of any international agreement on ethical standards in human experimentation became evident and led to the first worldwide-recognized ethical code on human research, the Nuremberg code, which was considered the standard for defining the acceptable limits of experimentation with human beings (Katz, 1996). However, this did not prevent some cases of unacceptable human research in Great Britain and the United States in the following years (Edelson, Beecher and Pappworth, 2004) that stimulated new regulations, such as the Helsinki Declaration by the World Medical Association in 1964 (Riis, 2003).

However, the value of bioethics in medical practice was not fully recognized until the problem of referring patients for dialysis treatment and kidney transplantation arose in the late 1950s. There were not enough machines to cater for so many patients, and this posed a difficult problem: which patients should be selected from among all of those who needed the treatment. The first specific bioethics committee was created to address this problem at the Seattle Artificial Kidney Center in 1961. This committee developed a list of selection criteria, called 'social worth criteria', that were not exclusively based on medical grounds. Later, the role of such committees to resolve ethical problems in many areas —clinical research, brain death, abortion, withdrawal of ventilation, to name but a few— was unanimously accepted, and many hospitals now have ethics committees to deal with such conflicts (Maehle, 2013). The modern use of term bioethics was coined by the American oncologist Potter in an article published in 1970 entitled "Bioethics: the science of survival". Since

then, this discipline has been an important component of medical activity, and nobody considers it useless in clinical medicine, showing that scientific medicine also needs input from other disciplines in order to make the best choices. This was the first occasion in modern times that the principles of a humanistic discipline, i.e. moral philosophy, were used to make medical choices. Now, many hospitals around the world have clinical ethics committees to ensure the best decisions are made for patients and health institutions based on a social, and not only medical, approach.

Academic medicine meets humanities

In the early twentieth century, William Osler strongly advocated the use of literary texts in medical education (Osler, 1932). He also considered that knowledge of the history of medicine was essential in order to better understand conflicts as well as the role of professionalism in medical practice. Progress in diagnostic and therapeutic approaches in the last hundred years has probably skewed medical education toward the biological aspects of disease to the detriment of humanistic aspects; indeed, many educators maintain that a medical student's education should focus exclusively on biomedical and clinical sciences.

Since William Osler, no serious attempt had been made to introduce this discipline to the academic world of medicine. Everything started to change when Pennsylvania State University opened its College of Medicine at Hershey in the early 1970s. In 1972, humanities were introduced to the medical studies with the appointment of Joanne Trautmann Banks as professor of literature (Hawkins and McEntyre, 2000). This unexpected turn of affairs was followed by the introduction of such subjects as history of medicine, bioethics, and anthropology. This experience quickly extended to other universities in the United States and abroad. In 1995, nearly one-third of American medical schools taught literature to their students (Hunter, Charon and Coulehan, 1995).

Evans wrote one of the best summaries of the interest and importance of humanities in medical education (Evans, 2005), where he listed five reasons to justify their inclusion: first, the humanities help students develop their interpretation and communication skills; second, they encourage students to develop their per-

sonal values; third, they help convince students to take experience and subjectivity seriously; fourth, they help students move beyond technical training to a complete university education; and fifth, they help students develop a feeling of wonder toward the natural universe, human nature, and embodied consciousness.

The present state of humanities in medical studies

Reviewing criticism and misunderstandings about the use of humanities in medical education, Shapiro *et al.* (2009) concluded that cross-disciplinary, collaborative recontextualization of medicine requires medical humanities to be close to the core of curricula rather than on the periphery as ‘adjuvant’ disciplines. They stated: “We will be able to use humanities’ intricate and sympathetic knowledge about the human condition as well as its ability to examine particularistic, experimental knowledge to help ensure a morally sensitive, narratively sound, and deeply professional clinical practice.” However, once the theoretical interest has been clearly established, it is necessary to obtain empirical evidence of how humanities can help improve medical education (Ousager and Johannessen, 2010), although not everyone would agree. For example, Jones (2014) wondered why it is deemed necessary to prove that the arts and humanities make better doctors when nobody demands similar justification for the traditional components of medical education, pointing out that most medical courses have not been subjected to pre- and post-test evaluation.

Literature provides a clear example of how the humanities can expand educational opportunities for medical students beyond technical training. Not only can literature strengthen and focus medical training toward a better understanding of the care of human patients, but it can also serve as a source of moral education. In recent years, the recognition of the value of patients’ narratives, of using literary texts as an adjuvant treatment for some diseases, and of learning about different experiences central to medicine (aging, disability, death) has boosted the use of literature at medical schools. Bolton (2001) summarized the importance of literature for medical students and physicians: “Literature is an essential study for medicine. It deepens the awareness

of issues and experiences one cannot or will never have. It offers first-rate material for ethical study (ethical dilemmas generally make a plot fizz). An understanding of narrative can help clinicians develop a dynamic relation with everyday complex stories of medical situations.” But perhaps one of the strongest defences of the usefulness of literature in medicine comes from Shapiro *et al.* (2015), who wrote: “We suggest that literature is an essential element of medical education that, through the method of close reading, contributes intellectual inquiry, emotional awareness, sociocultural context, and a countercultural perspective to questions regarding medical professionalism. Narrative and storytelling broaden and make more complex the ethical context of care provided by students and faculty [...] Literature can deepen the understanding of medical professionalism as many educators desire”.

Literature provides a clear example of how the humanities can expand educational opportunities for medical students beyond technical training

Additionally, it can be valuable to discuss, analyze, and understand controversial issues in literary texts; even many years after the texts were written. Jurecic and Marchalik (2017) recently published an interesting analysis of the value of Mary Shelley’s *Frankenstein or the Modern Prometheus*, published in 1818. They consider the book the first study of ethics in biomedical research and provide many examples to support this argument. *Frankenstein* has been used to depict fears about medical technologies and advances such as organ transplantation, *in vitro* fertilization, and animal cloning and, more recently, to warn against the misuses of CRISPR gene editing technology. In our opinion, however, the main message of Shelley’s novel is that our failure to take responsibility for our knowledge and decisions can have devastating consequences: Frankenstein’s rejection of the creature he created led to tragedy.

Cinema and TV medical dramas are also productive fields to analyze and discuss ethical issues in medical practice. They can help to understand situations from different points of view (of physicians, patients and other individuals) and these depictions also use visual language that triggers emotional engagement in the discussion of complex bioethical situations (Boon, 2013) and (Ostherr, 2013).

While the essential importance of bioethics in developing professionalism in medical students is generally acknowledged (Doukas, McCullough and Wear, 2012), the importance of the history of medicine in medical education has been diminishing, and this undesirable situation is a cause for concern. However, it seems unlikely that this subject will ever recover its place as an important and separate subject. Therefore, other strategies have been developed to expose students to the critical contents of this field, which include incorporating the history of medicine in faculty development programs, identifying members of medical school faculties interested in the subject, or considering introducing aspects related to the history of medicine to each major topic (Bryan and Longo, 2013). The trend is therefore to intermix contents from the history of medicine with other materials on each course, rather than to present them as a separate course.

The value of humanities in medical education

Empirical studies have found very interesting results on the incorporation of the humanities in medical education. For example, a study at a German university that asked first-year medical students about the importance of studying ethics and history of medicine found that they considered ethics significantly more important than the history of medicine, but it also showed that they considered ethics less amenable to teaching and testing (Schulz, Woestmann, Huenges, Scheweikardt and Schäfer, 2012). These results revealed students' prejudices about the value of the different subjects and should be considered when planning medical curricula. A preliminary report of an experience implementing a medical anthropology course found students had positive opinions about the way the course stimulated their awareness of specific local settings in medical thought and action, drew their attention to the subjectivity of the doctor/patient relationship, and sensitized them to the need to adapt medical terms to patients' needs, which are context dependent (Mohr, Hovemann and Roelcke, 2012). Another study found that third- and fourth-year medical students in India welcomed an optional module on medical humanities, as most enrolled (Gurtoo, Ranjan, Sud and Kumari, 2013). Most considered the module to be useful as it improved their motivation and prompted them to learn more about

core medical subjects; moreover, 85% were in favour of the course being kept on future curricula.

Empirical studies have found very interesting results on the incorporation of the humanities in medical education

Strategies for implementing humanities in medical curricula

Evans (2005) discussed ways to enhance the role of the humanities in medical education and suggested some ways to implement humanities programs. His first point is that the study of literature in medical education should focus on examples, insights, or reflections related to medicine, rather than on theories or methodological analyses. He also stresses that humanities perspectives may be better accepted and hence more valuable and influential if they are presented to illustrate ways of thinking about a clinical or scientific problem in the course of clinical or scientific modules taken by all students, rather than in specially designed humanities modules taken by only a few students. Finally, and perhaps most importantly from a conceptual point of view, he explains that it is important for teachers to realize that they are not instructing students in what they should think, but rather showing them other ways to think.

It seems unreasonable to expect new specific humanities subjects to be incorporated into medical students' crowded curricula. Some universities, such as Vanderbilt (Eichbaum, 2014), have adopted the approach of including humanistic contents in basic and clinical science subjects. This approach, based on metacognition, has three specific goals: to develop students as flexible thinkers with essential cognitive and emotional skills for coping with medical uncertainty; to improve their awareness of the diversity of human emotions and cognitions; and to allow the integration of basic and clinical sciences. This may be a good approach at medical schools where faculty are sensitive to these needs. Harvard University has also undertaken a pilot study to improve physician performance using visual arts (Katz and Khoshbin, 2014), with three courses: "Training the Eye: Improving the Art of Physical Diagnosis" for first year students, "The Brigham and Women's Hospital Internal Medicine Humanistic Curriculum" for

interns and internal medicine residents, and an interprofessional program for medical students in their general medicine rotation, “The Multidisciplinary Teambuilding Curriculum”, which is attended by physicians, nurses, residents, interns, medical students, pharmacy students, physical therapists, and care coordinators. There is a similar program at Georgetown University in which medical students read novels to “examine cultural conventions and conflicting perspectives, and reflect on our own preconceived notions about life and work” (Marchalik, 2016). Another example is the Northeast Ohio Medical University, which has a humanities program spread across the five-year curriculum that is required for all medical students (Kohn and Kodish, 2015).

Another way the humanities may be included in medical education is the “making strange” model detailed by Kumagai and Wear (Kumagai and Wear, 2014), which proposes the use of literature, films and art to portray events in a way that questions students’ assumptions, thus avoiding the ‘automaticity of thinking’ and challenging personal opinions through confrontation with completely different behaviours. In fact, the aim of including the humanities in medical studies is to educate students rather than to train them in technical aspects that are necessary but not sufficient for their future careers. Some initiatives, like *The Project to Rebalance and Integrate Medical Education* (PRIME), presented at the National Conference on Medical Education in 2012, have allowed experts in medical education to discuss these issues with representatives from different fields of humanities. This first meeting concluded that the development of professionalism is based on knowledge, attitudes, skills and behaviours that can be acquired from programs dealing with medical ethics and humanities subjects (Doukas, Kirch, Brigham, Barzansky, Wear, Carrese, et al., 2015).

Concluding remarks

In recent decades, the role of humanistic disciplines in medical humanities has extended in many other ways. Boudreau and Fuks (Boudreau and Fuks, 2015) summarized this evolution. The emphasis of philosophy courses has shifted from epistemology and metaphysics to bioethics, and some authors predict that bioethics will completely displace other branches of philosophy at medical schools (Stempsey, 2007). The initial interest in using literary texts has expanded

to include new interests, such as narrative competence, patients’ narratives, literature and movies as adjuvant treatments, so-called bibliotherapy and cinematherapy. Recently, many other disciplines have been incorporated into medical education, including gender studies, film, music, religious studies, and visual and performing arts, although some authors have claimed that the evidence for a positive long-term impact of integrating humanities in medical studies is still sparse (Ousager and Johannessen, 2010). A recent book compiled a set of experiences at Spanish and Italian universities that can help to design new activities and measure how the training of medical students can be improved (Orefice and Baños, 2018).

Some authors have suggested that a cultural context is essential for science and medicine and that a cultural vacuum can hinder their advance (Edgard and Pattison, 2006). The humanities can also help us to understand the interaction between cultural and clinical issues in modern societies. Ignoring the humanities deprives the population of many of the benefits of a broad education, but devoting time and resources to these subjects is clearly a challenge in our profit-oriented world.

A cultural context is essential for science and medicine and that a cultural vacuum can hinder their advance.

More than a century ago, Osler (1899) claimed that physicians should “care more particularly for the individual patient than for the special features of the disease”. Humanities can help complete and improve physicians’ knowledge of patients and thereby help make medical care more human and efficient.

References

- Ackerknecht EH. (1982). *A short history of medicine*. Revised edition. Baltimore & London.
- Annas GJ, Grodin MA. (1992). *The Nazi doctors and the Nuremberg code. Human rights and human experimentation*. Oxford: Oxford University Press.
- Bolton G. (2001). Literature and medicine. *Lancet* (357) pp. 1441-1442.
- Boon T. (2013). Medical film and television: An alternative path to the cultures of biomedicine. In Jackson M (ed.) *The Oxford Handbook of the History of Medicine*. Oxford: Oxford University Press. pp. 617-634.

- Boudreau JD, Fuks A. (2015). The humanities in medical education: Ways of knowing, doing and being. *Journal of Medical Humanities* (36). pp. 321-326.
- Bryan CS, Longo LD. (2013). Perspective: Teaching and mentoring the history of medicine: An Oslerian approach. *Academic Medicine* (88) pp. 97-101.
- Doukas DJ, Kirch DG, Brigham TP, Barzansky BM, Wear S, Carrese JA, et al. (2015). Transforming educational accountability in medical ethics and humanities education toward professionalism. *Academic Medicine* (90). pp. 738-743.
- Doukas DK, McCullough LB, Wear S. (2012). Project to Rebalance and Integrate Medical Education (PRIME) Investigators. Perspective: Medical education in medical ethics and humanities as the foundation for developing medical professionalism. *Academic Medicine* (87). pp. 334-341.
- Edelson PJ, Henry K Beecher and Maurice Pappworth: Honor in the development of ethics of human experimentation. In Roelcke V and Maio G (eds.) *Twentieth century ethics of human subjects research*. Stuttgart: Steiner, 2004; pp 219-233.
- Edgard A, Pattison S. (2006). Need humanities be so useless? Justifying the place and role of humanities as a critical resource for performance and practice. *Journal of Medical Humanities* (32). pp. 92-98.
- Eichbaum QG. (2014). Thinking about thinking and emotion: the metacognitive approach to the medical humanities that integrates the humanities with the basic and clinical sciences. *Perm Medical Journal* (18). pp. 64-75.
- Evans M. A philosophical perspective on the "renaissance" of humanities in medical education. 2005 Annual Conference of the Association of Medical Schools in Europe (AMSE). Turku, Finland, September 5, 2005. Available in: <http://congress.utu.fi/amse/programme.php>. Accessed 29/07/2019.
- Gurtoo A, Ranjan P, Sud R, Kumari A. (2013). A study of acceptability & feasibility of integrating humanities based study modules in undergraduate education. *Indian Journal of Medical Research* (137). pp. 197-202.
- Hunsaker Hawkins A, Chandler McEntyre M. (2000). Introduction: Teaching literature and medicine: A retrospective and a rationale. In Hunsaker Hawkins A, Chandler McEntyre M (eds.) *Teaching literature and medicine*. New York: Modern Language Association of America, pp. 1-28.
- Hunter KM, Charon R, Coulehan JL. (1995). The study of literature in medical education. *Academic Medicine* (70). pp. 787-794.
- Jones DS. (2014). A complete medical education includes the arts and humanities. *Virtual Mentor* (16). pp. 636-641.
- Jurecic A, Marchalik D. (2017). Dr Frankenstein's bioethical experiment. *Lancet* pp. 389:2465.
- Katz J. (1996). The Nuremberg code and the Nuremberg trial. A reappraisal. *JAMA* (276). pp. 1662-1666.
- Katz JT, Khoshbin S. (2014). Can visual arts training improve physician performance? *Trans Am Clin Climatol Assoc* (125). pp. 331-42; discussion pp. 341-2.
- Kohn M, Kodish E. (2015). Reuniting through the medical humanities: Two educators, two programs. *AMA J Ethics* (17). pp. 491-495.
- Kuhn T S. (1962). *The structure of scientific revolutions*. United States: University of Chicago Press.
- Kumagai AK, Wear D. (2014). "Making strange": A role for the humanities in medical education. *Academic Medicine* (89). pp. 973-977.
- Maehle AH. (2013). Medical ethics and the law. In: Jackson M (ed.). *The Oxford Handbook of the History of Medicine*. Oxford: Oxford University Press, pp. 543-560.
- Marchalik D. (2016). *Reading novels at medical school*. New York Times. Available in: <https://well.blogs.nytimes.com/2016/06/23/reading-novels-at-medical-school/?mcubz=0>. Accessed 27/07/2019.
- Mohr B, Hovemann P, Roelcke V. (2012). Participant observation and change of perspectives: Medical anthropology and the encounter with socially marginalised groups. First experiences with a new teaching concept. *GMS Z Med Ausbild*. 29(5): Doc66.
- Nussbaum M. (2010). *Not for profit: why democracy needs the humanities*. Princeton: Princeton University Press.

Ordine, Nuccio. (2013). *L'utilità dell'inutile*. Milano: Bompiani.

Orefice C, Baños JE. (2018). The role of humanities in the teaching of medical students. Monographs 38. Barcelona: Dr Antoni Esteve Foundation.

Osler W. Books and men. (1932). In *Aequanimitas*. 3rd ed. Philadelphia: Blakiston's son & Co, pp. 207-216.

Osler W. (1899). Address to the students of Albany Medical College. *Albany Med Ann* (20). pp. 307-309.

Osler W. (1932). *British medicine and greater Britain*. In *Aequanimitas*. With other addresses to medical students, nurses and practitioners of Medicine. 3rd ed. Philadelphia: Blakiston's son and Co, pp. 161-188.

Ostherr K. (2013). *Medical visions. Producing the patient through film, television, and imaging technologies*. Oxford: Oxford University Press.

Ousager J, Johannessen H. (2010). Humanities in undergraduate medical education: A literature review. *Academic Medicine* (85). pp. 988-990.

Percival T. (1803). *Medical ethics or, a code of institutes and precepts, adapted to the professional conduct of physicians and surgeons*. Manchester: Russell.

Porter R. (1998). Medicine, state and society. In Porter R. *The greatest benefit to mankind. A medical history of humanity*. New York & London, pp. 628-667.

Riis P. (2003). Thirty years if bioethics: the Helsinki Declaration 1964-2003. *New Rev Bioeth* (1). pp. 15-25.

Schulz S, Woestmann B, Huenges B, Scheweikardt C, Schäfer T. (2012). How important is medical ethics and history of medicine teaching in the medical curriculum? An empirical approach towards students' views. *GMS Z Med Ausbild* 29(1): Doc08.

Shapiro J, Coulehan J, Wear D, Montello M. (2009). Medical humanities and their discontents: definitions, critiques, and implications. *Academic Medicine* (84). pp. 192-198.

Shapiro J, Nixon LL, Wear SE, Doukas DJ. (2015). Medical professionalism: What the study of literature can contribute to the conversation. *Philos Ethics Humanit Med* 10:10.

Stempsey WE. (2007). Medical humanities and philosophy: Is the universe expanding or contracting? *Med Health Care Philos* (10). pp. 373-383.

Van der Eijk P. (2013). Medicine and Health in the Graeco-Roman World. In Jackson M (ed.) *The Oxford Handbook of the History of Medicine*. Oxford: Oxford University Press, pp. 21-49.

Watson P. (2009). Ideas: A history from fire to Freud. London: *The Folio Society* (1). pp. 415-444. [Original edition: *Ideas: A history of thought and invention, from fire to Freud*. HarperCollins Pub, 2005].

Case Study — Territorial Awareness at Rovira i Virgili University (URV): A Chemical Itinerary in the City of Tarragona (Catalonia, Spain)

Núria Ruiz

The design of a chemical itinerary is a teaching experience aimed at promoting local knowledge and taking advantage of the resources that the territory itself offers us. The experience is carried out as part of the master's degree in Teacher Training for Compulsory Secondary Education, Higher Secondary Education, Vocational Training and Language Teaching.

This Master's degree provides the pedagogical and didactic training that enables students to teach professionally in both public and private secondary schools, vocational training centers and language schools, in accordance with the Spanish curriculum. The degree is structured in two parts: it begins with a compulsory set of common subjects in the field of pedagogy and psychology, and continues with different branches of specialization, which include specific subjects in each field of knowledge. The branches at Rovira i Virgili University are: Biology/Geology, Business Administration, Catalan and Spanish Language and Literature, Economics, Foreign Languages, Geography/History, Industrial Technologies, Physics/Chemistry and Technology. This teaching experience forms part of a subject in the Physics/Chemistry specialty called Learning and Teaching of Physics and Chemistry (10 ECTS).

Because of its commitment to its local territory, Rovira i Virgili University strongly encourages the transfer of knowledge to society and does so in two broad ways: on the one hand, the transfer of knowledge and technology to the economic and production sectors and, on the other, a focus on the transfer of knowledge to society in general.

This teaching activity addresses the latter, since it fosters the dissemination of culture and knowledge throughout the local territory and population and, at the same time, introduces the values of science and humanism to society.

From the beginning, students are viewed as real Physics and Chemistry teachers as they are tasked with the development of an environment-related didactic resource for inclusion in their academic programs.

The activity is designed in the classroom but carried out outdoors in such a way that a connection between the university and the local territory is encouraged.

Although the contemporary development of Tarragona has been heavily driven by its petrochemical complex, our activity is not focused on the industrial aspects of chemistry, but deals with the bigger picture: we wanted to go further and propose a transversal activity that not only addresses scientific aspects but also cultural, artistic, historical and architectural aspects.

To do so, the students were organized into teaching teams and tasked with the creation of the contents at each stop on the itinerary.

The first session was a brainstorming exercise to identify places in Tarragona that could be significant from a physicochemical perspective. A blackboard was filled with a variety of places and many ideas. Then, with a laptop, internet connection and the help of Google Maps, they located the different spots on a virtual map in order to calculate the time needed to visit them all on foot. Finally, seven locations were selected for a walking tour that lasted about 35 minutes. As an activity lasting about 5-10 minutes had to be performed at each location, the total estimated time for the itinerary was approximately 90 minutes.

A second session was dedicated to designing the activities for this itinerary. Two activities were designed for each location: one aimed at Compulsory Secondary Education (pupils aged 14-15 years) and one at Higher Secondary Education (pupils aged 17-18 years). This meant that the same itinerary could be used for two different education levels.

The final selected places and scientific topics were the following:

- Imperial Tarraco Square – Combustion, gases and acid rain.
- The monument to Castellars – Newtonian forces.
- Central Market of Tarragona - Food pH.
- The port and the petrochemical industry – Oil and hydrocarbons.
- Balcony to the Mediterranean - Metals: Reduction and oxidation reactions.
- El Miracle Beach – Saturated chemical solutions.
- Tarragona roman city walls and Camp de Mart – Stone composition.

Each location-activity has its own dossier including the geographic coordinates, an historical, architectural, artistic or cultural description of the site and the scientific activity to be performed. Thus, when doing the itinerary, the teacher can provide a small explanation of the context before the students proceed with the scientific activity.

Once the design of the itinerary was finalized, a pilot tour was organized involving all of the students who designed the activity. Two external experts were also invited to join and evaluate this first tour, share their impressions and help to improve the activity: a teacher from a secondary school and a Science Communication professional. A new trip was recently organized with real secondary school pupils. Both experiences were highly satisfactory for both the participants and the organizers.

Given the characteristics of this master's degree, our students will, in the near future, be teaching other students. Hence the importance of learning how to design activities related to the local territory, either to be reproduced afterwards, or to know how to design new ones. Therefore, these training programs transcend the university boundaries and are ultimately addressed at a broader audience in the local area.

Case Study — Neurosciences and the Humanities: Teaching Neurosciences as a Liberal Art

Fernando Giraldez

Below is a brief description of the goals and scope of “Neurosciences and the Humanities: Art, Philosophy and the Brain”, an undergraduate course offered at the Universitat Pompeu Fabra in Barcelona. It is a 4 ECT-module addressed at students from any background. Versions of the course are also offered as summer courses (BISS, UPF) or as part of the university’s international study program (HESP- UFP)

The quest to understand the mind has been a challenge for scientists, philosophers and artists who have devoted their lives to unraveling its elusive nature. Questions like the nature of consciousness, the limits of human knowledge, the nature of aesthetic experience, and the nature/nurture problem are all “questions of thought”; they have been with us since the first records of human reflection. The scientific roots of art have also preoccupied great painters, sculptors and architects who have explored physics and physiology alongside their artistic creations. And, likewise, remarkable scientists have been interested in and inspired by philosophical questions or by art. It is important to get this across in higher education, where the barriers need to be broken down between fields of expertise, which is only partly due to specialization, but also and more frequently to tradition, corporatism or simply narrow-mindedness. The clash between science and humanities that is so prevalent in schools and universities is probably a false problem that conceals the real dilemma between knowledge and ignorance. In the complex world in which our students will work professionally, it is of crucial importance to have solid technical competence, as well as the kind of open mind that only culture can provide. This not only implies the need for better resources to tackle the new and changing job market, but also to be better, more open-minded leaders in a world where critical thinking is such a crucial factor behind wisdom: a scientific attitude along with a cultivated mind.

In higher education, attempts are frequently made to blend science and liberal arts through introductory science courses for social scientists and humanities for scientists. This is generally a good thing, and provides some mutual knowledge and understanding. It improves our students’ scientific and general culture, and helps them to understand the approaches and methods of different disciplines. However, I believe that this might have the undesirable side-effect of reinforcing “expertise boundaries” and may lead to views that are too general and superficial. An interesting alternative would be to find spaces where scientific and cultural issues are discussed on a shared playing field. This is what I mean by teaching science as a liberal art: to bring science to the field of ideas.

Neuroscience provides a wonderful opportunity to integrate knowledge from human and natural sciences. In recent decades, brain research has made important advances in offering new perspectives on some of the problems mentioned above. Perception, memory, emotions, development and mental disease are topics that relate to the concept of “the mind”. Our knowledge of the brain comes from studying humans and other animals, and it has a strong evolutionary perspective. This knowledge goes far beyond its traditional domains, like neurology and psychiatry, to also have an impact on other fields of knowledge, such as philosophy, art, economy, education, law and even gastronomy. In order to educate, the challenge is to find spaces where culture and neuroscience can be discussed on equal terms, on common ground.

At GUNi Barcelona⁽¹⁾, I briefly presented my two-decade experience of teaching Neuroscience, Art and Philosophy. The goal of the course is to show how scientific

1. <http://www.guninetwork.org/activity/international-conference-humanities-and-higher-education>

knowledge of the brain leads to the revival of classic questions from philosophy and art. And *vice versa*, how philosophers and artists have explored the brain and posed crucial scientific questions. This offers a good opportunity to re-examine the work of great thinkers and artists from another perspective –besides being an excellent excuse to read and admire cultural masterpieces. As mentioned above, this is not just a general introductory course, but examines certain neurophysiological problems in some depth, and links them to “cultural” questions. We want to link genes and neurons with Plato’s Allegory of the Cave or Leonardo’s *sfumatto*. On this course, an understanding of the synaptic organization of center-surround receptive fields of retinal neurons is as important as understanding the concept of form in an excerpt from Plato’s dialogues. This is the scope. The goal is to get students of humanities and sciences to feel the connection between science and ideas, and the importance of ideas for science.

The core of the course is the physiology of perception, which throughout the history of neuroscience has been a window to the brain. Once one starts to explore the roots of perception, how sensory receptors operate, what we mean by “sensory modality” or how central mechanisms are organized, a series of fundamental philosophical questions emerge naturally. This is where we need to go back to the writings of the great thinkers of the past. Scientists and philosophers, natural philosophers of the scientific revolutions and the Enlightenment, were particularly concerned about the problem of how we ground knowledge, something that therein became one of the biggest, if not the biggest, questions in modern philosophy. The physiology of the senses has a lot to say about how we get knowledge about the world and it provides us with a good framework to approach these problems -one student of philosophy who took the course once told me that I was not teaching neuroscience, but epistemology.

The above leads to the interesting discussion about the differences between science and belief. As humans, we live in permanent conflict between the need to know and the need to react, and evolution is pushing us both to explore and change, and to conserve and manage efficiently what we have. Our daily behavior requires a highly aprioristic way of interpreting the world, which relies on the innumerable assumptions and implicit knowledge we acquire throughout our lives. Those models are based on our perceptions and cannot go further than our own experience. They are the path to

belief, a rather timely problem in today’s world. In this part, Russell, Chomsky and Hanna Arednt are discussed along with pseudoscience and post-truth.

The rules of perception also lead naturally to the rules of art, a connection that has been explored extensively by Kandel, Zeki, Livingstone, Changeux and Ramachandran, to cite only a few of the pioneering neuroscientists, and who converge with art scholars who have investigated the psychology of art perception, the best known probably being Gombrich. The goal of this part of the course is to pose the following question: “if beauty is in the eye of the beholder, what is in the beholder’s eye?” The perception of space, form and color are analyzed, and related to the perception of painting. One major technical problem faced by classical painting was the representation of the real world on a flat canvas, the “conquest of space” of the Baroque period. We discuss the rules of art -*les règles d’art*, and the idea of artists as intuitive neuroscientists exploring the brain. The physiology of vision illustrates the several “tricks” used by great painters to confuse our perception, to create illusions to convey convincing meaning. The many examples include an understanding of foveal vs. peripheral vision, the processing of color and movement, and the dynamic range of face cells in the IT cortex. Moreover, the discussion regarding the perception of space connects directly with the breakthroughs in painting from the Renaissance and Baroque periods, a wonderful excuse to explore the “El Prado collection” and look at the masters of classical painting. But beyond the anecdote of explaining this or that particular technique or artistic success, we also disclose here the concept of the grammar used in artistic creation. This is some food for general discussion on aesthetic universals, and on philosophical ideas of beauty. At this point, the students do a “Little Artwork project”, where they produce something that they consider “beautiful” or “aesthetic”, generally a photograph, their task being to analyze the perceptual rules implicitly present in the picture; a way to explore the neuroscience behind their own experience of beauty. This highly engaging experience was suggested to me by Jean Hertzberg (University of Colorado Boulder) who teaches “art and physics of flow” (see <https://www.colorado.edu/mechanical/flowvis>).

To finish, there is a general discussion on “genes and culture”, nature and nurture, a problem that is full of misunderstandings and disinformation. We first clarify the number of ideological, religious and political prejudices around this topic. Secondly, we discuss the

complexity of the interactions between genes and the environment occurring throughout our lives, with particular attention to the concept of gene expression, neuronal plasticity and “critical periods”. And finally, within this framework, we discuss topics like human intelligence, musical talent and psychiatric disease.

In summary, the course intends to bring neuroscience to the field of cultural discussion, to think about “what kind of creatures we are”, to exercise the skeptical scientific attitude on ourselves, to stimulate curiosity and interest in classical philosophy, art, and music and ultimately, to look at highbrow culture from another perspective.

Further information: <https://www.upf.edu/documents/3958335/215761782/19+HESP+NEURO.pdf/c1ca8b20-5407-294e-b41c-fe8c12a7aaa4>

Case Study — Geography and History of the Social Education

Quim Bonastra, Monica Degen, Rosa M. Gil, Daniel Gutiérrez-Ujaque, Gloria Jové, Guillem Roca

Introduction

We discuss here the experience of carrying out an innovative teaching project among second-year students from a Social Education degree and from an Industrial Engineering (mechanical and electronics speciality) degree at the University of Lleida. The purpose of the students' projects was to respond to social problems from a social and technical perspective through inter-transdisciplinary and creative-artistic thinking. Over the last two academic years, more than 300 students have proposed sustainable, inclusive, critical and innovative solutions to real everyday problems in the city of Lleida. Simultaneously, as educators teaching on this project, we have transformed the classroom into a transformative, flexible and dynamic learning space.

On both courses, teaching began in a specific, patrimonial context: the square with an old water reservoir in the city of Lleida (Figure 1). As shown in the illustrations, this space contained the city's water reservoir, which provided sustainable water to the whole city

from its construction in the late eighteenth century to the 1980s. This heritage space is currently located in the historic centre of the city, a marginal space but earmarked to be transformed through gentrification and urban regeneration.

During the first year, the university schedule had no joint programme between both disciplines. So, the teachers created different sessions to transfer the data and knowledge between degrees. In this case, students carried out projects to raise awareness about the use of water by the population of Lleida. During the course of the project, Agnes Pe, an artist who works with sound and everyday life, collaborated with us. All these inputs allowed the engineers to design different sensor prototypes (Figure 2), while the social education students analysed the social impact on water consumption and current social and environmental policies in the city. Furthermore, the projects contributed new data and new possibilities to the reservoir facilities and influenced the museum institution itself, improving the guided tour of the reservoir. Below are some of the proposals:

Figure 1. Water reservoir (Lleida, Spain).

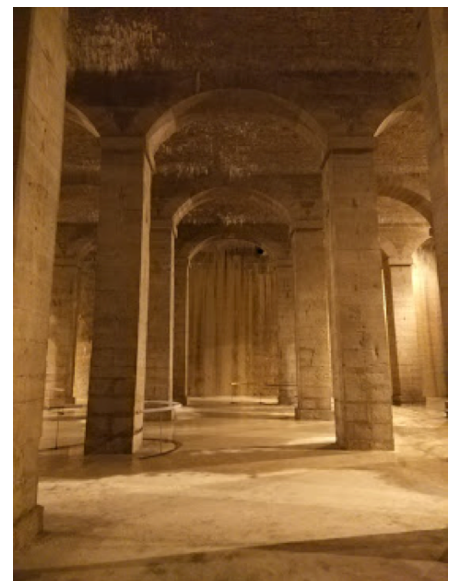
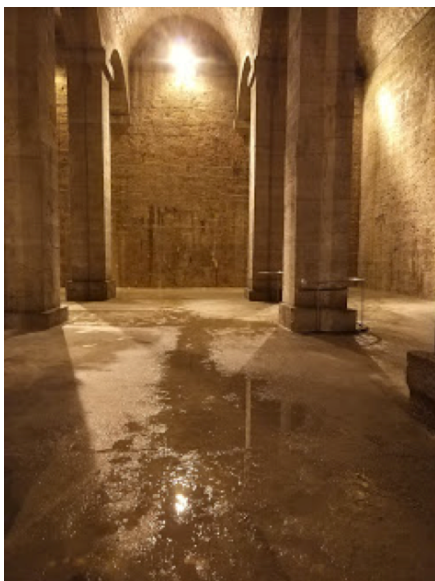
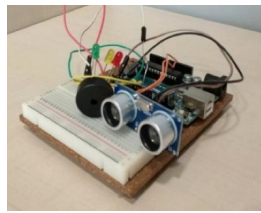


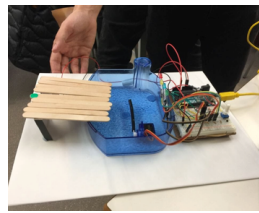
Figure 2. Examples of proposals made by students in the 2017-2018 academic year. Source: The authors



Pelton turbine prototype



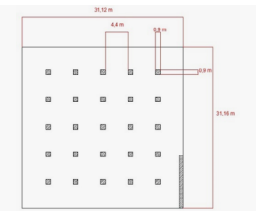
Motion sensor prototype



Prototype design of data capture from monitoring visitor interaction



Museum design between the work Ascención (2000) by Bill Viola and the reservoir facilities



Accurate measurements of the water reservoir generated by laser meter

2. The process of “becoming” within the university education

At the start of the project, we thought about the kind of divergent processes that could emerge from the sensory ethnography, and how the Sustainable Development Goals could help to expand the students' projects. The following illustration shows the names of projects that met the selected objectives.

As shown in Figure 3, 12 of the 17 Sustainable Development Goals (SDGs) have been covered by the hybridization of the social and technological projects by students on both degrees. A relational table between the projects, the category, the proposal and the connection with the SDGs is shown below:

SDGs



Table 1. Relationship between the projects with the proposal and the Sustainable Development Goals

Project	Category	Proposal	SDG
1, 3, 19, 24	Leisure spaces	Create leisure spaces in the historic centre to enhance the social relationships of people who inhabit it.	1, 3, 4, 5, 7, 8, 9, 10, 11
7, 8, 13, 26	Home automation	Implementation of sensors in different urban facilities to improve the lifestyles of the people who live in those spaces.	1, 2, 3, 4, 7, 10, 11, 13
11, 12	Parking	Manage and enable parking spaces in the historic centre of the city.	3, 11
4, 17, 23	Urban lighting	Install lighting with presence sensors in the poorly lit streets and urban spaces in the city.	3, 7, 9, 10, 11
2, 6, 14, 25	Sustainable energies	Improve the energy efficiency of homes and other public or private spaces in the historic centre of the city.	1, 3, 7
5, 6, 9, 15, 16	Attention to diversity	Create technological facilities in public spaces that allow the inclusiveness of all people.	11, 12
18, 21, 22	Software Applications	Creation of applications to manage and improve social communication in public and private spaces.	1, 4, 9, 10
10, 20, 27	Recycling	Creation of recycling mechanisms in public spaces with a low environmental impact and low financial cost.	7, 8, 11, 12, 13

Source: The authors

Figure 3. Students from both degrees working together on their projects. Source: Montage from the authors' own photo



As shown in table 1, the 27 projects have covered a wide range of social problems identified through their urban ethnography. Throughout this process, teachers generated different scaffoldings to strengthen the projects. Likewise, this process involved the participation of the artist and activist Daniel García Andújar, whose work revolves around the issues of democracy and inequality in the information society. For two weeks, he worked with each group in order to investigate the (in) visible power relations in the city. Through interventions in public space, an exploration of power relations and critical use of digital media, Andújar's work brought out these issues in the students' projects. This is reflected some of the students' opinions.

"Daniel G. Andújar has allowed us to go further and see the cultural realities of the historic centre of the city of Lleida."

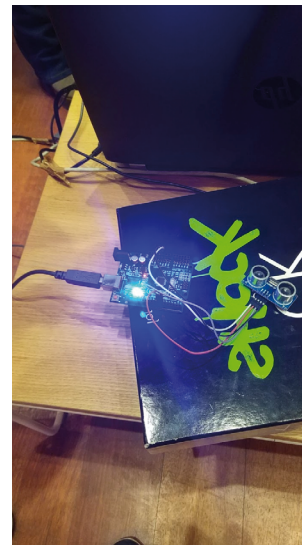
"Andújar's contribution made it possible for us to reflect on how there are many discourses that are invisible in society, as well as the social exclusion that it supposes for certain groups."

These comments show how Andújar's creative processes got the projects more involved with people in the neighbourhood, highlighting the prejudices and stigmas of students themselves. This experience was also enriching for the teachers, for Andujar's creative process provided us with multiple teaching resources. His participation focused on the creative processes that he uses in his own artistic work. A group of students said:

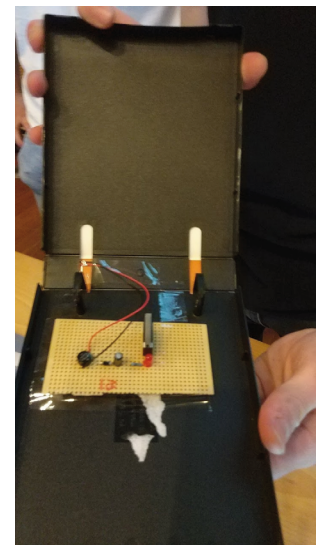
"Knowing about this artist's creative process generated new insights (to our way of thinking) to our research. His contributions from contemporary art played a key role in carrying out this research in a more in-depth manner."

This discussion has presented the outcomes of collaborative work between social education and industrial engineering students, which covered many of the goals set by the 2030 Agenda (Table 1 and Figure 3). This is due to the methodology used in the project, involving an inter-transdisciplinary approach to knowledge and providing a more holistic view of real problems in the everyday life of the city. Some of the prototypes that emerged are shown below:

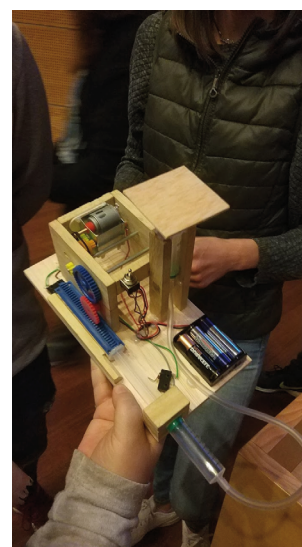
Figure 4. Some of the proposals made by the students from the 2018-2019 academic year



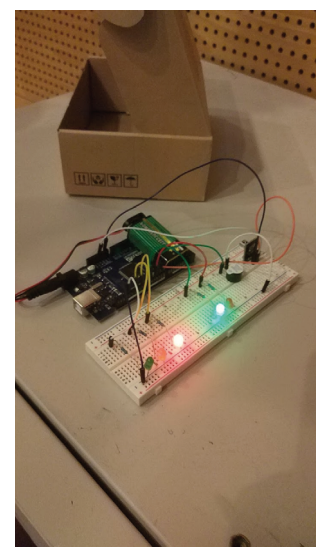
Parking proximity sensor



Piezoelectric sensors to store energy



Hydraulic lift model



Arduino to control traffic lights

Source: The authors

3. Conclusions

Our discussion has emphasized how these projects emerged from groups formed by social education and industrial engineering students, with the teachers mediating through different conceptual and practical scaffolding. Additionally, the participation of the artists Pe and Andújar allowed the students to focus their attention on artistic and social discourses. This experience shows how a methodological approach based on the concept of assemblage, the use of contemporary art, the social and historical space and the territory can lead to the design of new curricula in an interrogative, critical and cooperative manner to thereby achieve transversal humanism.

*This research is part of Daniel Gutiérrez-Ujaque's doctoral thesis that will be submitted in November 2019.

Case Study — Integrating Social Sciences and Humanities into Teaching about Energy: The TEACHENER Project

Meritxell Martell and Piotr Stankiewicz

TEACHENER is a transnational Strategic Partnership Erasmus+ project (2016-2019) that involves 7 organisations from both the social and technical sciences dealing with energy issues in the Czech Republic, Germany, Poland and Spain. The goal of TEACHENER is to fill the gap between social sciences and humanities (SSH) and energy teaching at technical universities in Europe and contribute to enhancing the socio-technical perspective in the current education of energy engineers. The project is led by the Institute of Sociology of the Nicolaus Copernicus University in Poland.

Current relations between SSH and teaching about energy

The first part of the TEACHENER project was to provide an overview of the existing relations between social sciences and humanities (SSH) and teaching about energy at the partner higher education institutions (Czech Technical University in the Czech Republic, Technical University of Catalonia in Spain, Helmholtz Centre for Environmental Research in Germany and Gdańsk University of Technology in Poland) and also other institutions in the partner countries. A survey and interviews were conducted in order to identify existing gaps in SSH in energy teaching as well as needs and expectations of students and teachers in energy-related teaching programmes at Master and PhD levels. Whilst graduates from technical higher education institutions are expected to be well-trained engineers and natural scientists, they are also required to have competences in social aspects of energy uses. However, energy teaching is still dominated by technological aspects and the broad social dimension of energy is marginalized. National workshops were held with representatives

from public administration, academia, businesses and research institutions in the four TEACHENER countries to discuss the needs and expectations of businesses and public administrations regarding the education of technical energy studies graduates.

The TEACHENER Edu-Kit

The second part of the project focused on the design and development of an Edu-Kit, a complex set of ready-to-use 4 to 10 hour teaching modules covering various topics associated with social aspects of energy for educating Master and PhD Students. The TEACHENER Edu-kit:

- Provides background information for the teachers on 8 topics (e-book with eight chapters, one per teaching module);
- Prepares content in the form of Power Point presentations;
- Designs teaching sessions in interactive formats – group work, exercises, debates, real life case studies, role play, etc.;
- Offers the option of individually selecting the course length due to the modular style;
- Offers a considerable collection of resources.

The Edu-Kit is freely available on a web platform that will provide a virtual learning environment where teachers and students will have access to all teaching tools and supporting material developed by the TEACHENER project.

The topics of the eight *Teaching Modules* constituting the Edu-Kit include:

1. *Energy awareness. Being aware of the importance of energy (for our life).* This module aims to reflect on the need to address societal aspects (e.g. individuals' motivations and behavioural changes) beyond technical

ones, when raising energy awareness and implementing energy policies and projects. It also draws attention to the vital importance of SSH for addressing the socio-technical challenges related to secure, clean and efficient use of energy. It is of utmost importance that technology students are aware of the social aspects involved in the implementation of energy policies or projects and that they understand the terminology and concepts, so that they can frame questions more broadly when addressing social issues in this context.

2. *Philosophy and ethics of energy development. Fundamental questions behind the use of energy.* This module considers that thinking only in terms of feasibility of technical innovations may prove misleading. Instead of waiting for various and possibly undesirable, harmful or unjust consequences of technological innovations, we should instead follow the precautionary principle, and explore and map social impacts at an initial stage. Social impacts very often turn out to be interconnected with concerns about safety and possible risks. Going beyond the standpoint of technical acceptability requires taking into account *social acceptability*, which should consider more general philosophical and ethical questions.
3. *Energy and the public: the challenge of understanding public responses.* The focus of this module is twofold: on individuals, communities and businesses as stakeholders in energy issues and on policies and practices of energy governance. It explains public opinion surveys and how social data related to energy issues should be read, and also provides an overview of energy governance in the EU and exercises practices for participation in decision-making.
4. *Social impact of energy technologies. Assessing social impacts through Social Life Cycle Assessment.* Social indicators are currently being considered for energy projects, along with the technical, economic and environmental aspects. However, the overall social impact on a local and global scale is barely addressed by most currently used methods for social evaluation in the energy field. This is the reason why this module introduces Social Life Cycle Assessment methodology to the students and raises their awareness of the importance of social criteria through assessment of the local and global social impacts related to energy projects.
5. *Technology assessment. An approach for organising societal discourse on innovative energy technologies.* In this module, students will learn about the historical development of technology assessments, the current

role of parliamentary technology assessments in Western societies, as well as the basic principles of technology assessment. Students will acquire knowledge about the current practices involved in technology assessment, its basic assumptions and main goals.

6. *Risk governance approach in smart metering. Smart metering, social risk perception and risk governance.* Smart metering is used as a demonstrative example of a 'risk governance' framework on this course. Rapid development of smart grids and smart meters (as well as other modern technologies) requires farsighted policy and social awareness to avoid harming society. This module consists of three main parts: risk perception, risk communication and risk management associated to smart grids and smart metering technology.
7. *Conflict management. Understanding and managing conflicts on energy technologies.* This module provides a general introduction to a social sciences perspective on technological controversies. It also teaches the necessary techniques for revealing and understanding the different interests, objectives and values of actors that come into play in technological controversies and develops central questions to analyse and understand a technological controversy.
8. *Decentralised energy systems. Social aspects of energy production and use.* The change towards decentralised energy systems implies not only the implementation of new energy technologies, but also important social, cultural and political transformations in our societies. This shift allows a large number of consumers to become producers and to manage their energy consumption more responsibly. This requires a comprehensive assessment of their sociotechnical co-evolution, of how technologies and societal responses evolve together, and of how their co-evolution affects current trends. The course analyses drivers, dynamics and consequences of those complex socio-cultural trends and focuses on the strategic analysis of possible future scenarios.

The modules have been tested at the partners' technical institutions and during two Student Winter Schools held at UPC and UFZ in February and March 2019 respectively.

The innovative educational practices in SSH offered by TEACHENER will provide graduates of technical energy studies with interdisciplinary skills, knowledge and competences that will enable them to better respond to the needs of the labour market in the energy transition.

Further information: www.teachener.eu

12. What skills and abilities need to be acquired in order to deal with the current changes to the employment, social and economic system on a global level?

Education in the Era of Automation and Artificial Intelligence

Ana María Fernández, Anna Forés, Gilberto Pinzón

Abstract

We live in a world with more than 50 billion sensors, which interconnect machines through the Internet, store information and apply algorithms to analyse it and generate solutions or decisions without us being involved at all. This is an era in which machines learn and use that learning autonomously to improve their tasks. Technology, computers and software are now able to effectively and efficiently accomplish complex functions that were once strictly performed by humans and that we once believed could never be replaced by machines. Technology is changing the way we interact, communicate, work, entertain, travel and learn. It affects us to the extent that we are developing new skills and losing others once considered fundamental.

We must rethink the way we deal with today's world, what we do every day, and ask ourselves what it is that we must focus on to be relevant, to add value to the environment, to ourselves and to others. We must be aware of the enormous challenges generated by artificial intelligence, machine learning and automation. What set of skills, attitudes, dispositions, knowledge and behaviours do we require? What "human" aspects of the human being are essential and crucial for an uncertain future?

The current education model has been consolidated for more than 300 years. It is firmly implanted in the majority of the world's classrooms. This model does not consider the major changes and challenges we face. Education is not advancing at the pace of other disciplines such as neuroscience that today clarifies fundamental elements of the brain, learning and the participation of emotions. This article seeks to analyse the role of education in this era and what its approach could be to the development of a human being that contributes to the sustainability of its species and the environment in which it lives.

The Great Differentiator

For millennia and since the time when we appeared on the face of the earth, man has been in a constant and progressive process of development. Beyond the self-criticisms of its negative impact, one cannot deny the fact that our species has not only survived for thousands of years, but has also increased its population, reaching every corner of the earth, increasing its life expectancy by improving sanitation, and improving wellbeing for humankind in general. It is clear that during that process we have made mistakes and continue to make them with regards to injustice, the need for more, the belief that we are more; the need to dominate and the lack of vision of the impact of our decisions in the middle and long terms; but despite all this, as a group we have been able to consolidate and overcome obstacles and become the dominant species on the planet.

Humanity has experienced cycles, moments of darkness and flourishing generated by different series of events, scientific developments and discoveries (oxygen, penicillin, gravity, the human genome, etc.), new technologies (Gutenberg's printing press, electricity, the steam engine, internet, etc.) in a synergic manner, acting to produce the changes that make us who we are and what we are today as a living collective.

Knowing, and the capacity to learn, are the cornerstones of an individual and thus, of the species. They are the pillars and the main differentiator. Man is able to learn for himself, day by day and throughout the years; to transmit these lessons "one to one", from generation to generation, father/mother to son/daughter, instructor to apprentice. But man has also been able to automate that learning process which, together with his conquests and developments, has led to the expansion of knowledge so that it may reach more individuals, and faster.

This is what we understand by "education", which refers to the intentional process of using methods and strategies that have been devised and structured to promote knowledge, facilitate learning and enable the acquisi-

tion of knowledge, skills, values, beliefs and behaviors. The basic objectives of education are to give the individual the wisdom and tools to better understand the world, his/her environment and him/herself, and the power to adapt to their moment in time in order to contribute what he/she has learned.

In other words, the purposes of education are: (1) forming a good human being; which for us is someone who lives in internal and external balance, who looks for purpose and meaning in everything he/she does and adds value to any situation he/she encounters, and (2) giving that individual the tools to perform correctly in the time in which they live. Unfortunately, we have frequently simplified the purpose of education and distorted it with the idea that it is the vehicle to generate efficient, capable, and productive workers. We have connected it to the economic model; we think, we design, we structure, and we assess the success of education on the principle that this is a “factory” of workers that have been trained with the tools and knowledge that the production system requires, forgetting about the importance of forming “human” human beings, with a complete set of attributes, values, behaviors, and attitudes to help them live in a quest for balance both internally and with their environment, to develop a life with meaning, and to use their wisdom to add value to this environment in due time.

As would be expected, this automation of learning requires constant revision of its structure, its components, and its contributions within the context and era in which it is implemented. The expansion of education has, without doubt, accelerated the development of humanity and thus requires permanent feedback to adjust and redefine its configuration and its purposes. The big challenge is understanding that the increase in access to knowledge, and the construction of skills, is getting faster every day, and for that same reason, humanity is capable of producing new technologies and developments that promote and require new dexterities and greater knowledge that must be provided by education.

The residual of education

Ron Ritchhard et al. (2011), ask what the residual of education should be. In other words, what should students take home after having been exposed to 12 to 14 years of school education? We have asked this question many times to hundreds of parents and teachers – in almost 100% of cases the answers relate to the search for and the development of happiness, autonomy, values, resilience, discipline, critical thinking, creativity, the capacity to work in teams, communication skills and all the other attributes, behaviors and dispositions that are not necessarily those that the current education system evaluates, which focuses mainly on measuring the incorporation of knowledge and the memorization of information. The surveyed parents and teachers rarely refer in their answers to topics related to the different academic areas and the knowledge related to mathematics, sciences, history, geography, and other subjects on the curriculum. It is somewhat ironic that we agree on what we truly believe has value, but we dedicate time and resources to what we do not consider a priority.

With regards to skills, wisdom, and dexterity, around the beginning of the 20th century, knowing how to saddle or shoe a horse was important for a large part of the population. But just a few decades later, this is no longer the case, and nowadays it is only considered a necessary skill among certain disperse groups of non-technified rural populations and people that practice equestrian sports. Values, beliefs, and behaviors also face challenges as humanity develops. The complexity is directly proportional to the amount of people that belong to a group or the connectivity between social groups. As the population grows and interconnects with other groups and different cultural elements, it becomes more difficult to coexist and, therefore, the set of values, beliefs, and behaviors of each group face important challenges, and so individual and social groups develop and enhance their understanding, tolerance, respect, and appreciation for other people and societies.

Parents and educators are commonly heard saying that “today’s children are not interested in anything”, or “teenagers are only interested in video games and social networks.” We should ask ourselves is whether it is really true that nothing interests them? Or is it perhaps that the education system has focused on an educational residual that is not aligned with today’s world and thus with its students.

Don't blame the children

John Hattie (2009) says “Don't blame the children”, which invites us to reflect on the fact that, even though many innovative ideas are aimed at rethinking education, many education systems and schools around the planet are still unaware that the current model is completely disconnected from the world in which we live. Students today can learn more than ever about almost any topic without the help of teachers or without having to attend school. Additionally, there is important evidence that shows that it is more efficient and cheaper for students to learn different academic subjects through the use of computers and software than with the participation of teachers. We still make students memorize content that is irrelevant to them, not necessarily because it is irrelevant, but because we have made it so for them, primarily because students cannot connect that content to their world, and find no greater sense in learning what they learn other than they must because it is homework, appears in a test or will help them to get into a university in the future. They say this because it is what they hear from their teachers and parents. The emphasis is not on learning to understand their world and their surroundings, but on passing exams or getting a good grade. That is the message that we have been giving them, and that is what motivates them to learn. Hattie also tells us that “every student deserves a good teacher, but not by luck, by design”. We need a different kind of teacher, one that understands that his/her role goes beyond teaching knowledge. In a world where knowledge and information are exponentially duplicating, we cannot expect teachers to know it all and even less for the ceiling of their knowledge to be the limit of their students' learning. The teacher needs to reinvent him/herself on the understanding that students can acquire knowledge and learn without help, but that they need to develop skills, dispositions, attitudes, values, and behaviors that are crucial for their lives and where the teacher can play a definite role.

What schools must focus on

Current and coming generations face complex challenges of different types. Scientific advancements will bring unthinkable moral and ethical dilemmas. Vertiginous developments in scientific areas such as genetics, medicine, biology, chemistry, and physics undoubtedly contribute knowledge and applications that benefit humanity, but at the same time they open windows and possibilities that, as with any advancement, require deep reflection about their scope and impact in the middle and long terms. The inadequate use of discoveries is something that we have already suffered throughout humanity, but today, with the acceleration of discoveries in all areas of knowledge, we are being bombarded by a very high volume of developments that are difficult to process adequately and whose impact might only be understood when it is already too late. Likewise, technological developments linked to AI are replacing the tasks and activities that humans perform, including those that require a high cognitive level, which have always been the exclusive domain of human beings.

Vertiginous developments in scientific areas such as genetics, medicine, biology, chemistry, and physics undoubtedly contribute knowledge and applications that benefit humanity, but at the same time they open windows and possibilities that, as with any advancement, require deep reflection about their scope and impact in the middle and long terms

We believe that education at schools must revise its role and focus on two main objectives:

1. Form good human beings, which we define as people that are constantly searching for interior balance in spiritual, intellectual, emotional, mental, and physical terms, as well as balance with their environment, other beings, and nature. A good human being must live a meaningful life, do whatever they do with a purpose, looking to add value in everything they do, for which they must develop the wisdom to choose and make decisions that build and contribute not only to themselves, but to others and to their surroundings.
2. For these human beings to incorporate a set of dexterities, skills, attitudes, knowledge and behaviors that help them to better adapt to the world they live in and to contribute to it.

Examples of classroom practices that encompass the proposed focus

Case 1, Palm Beach Day School, Palm Beach, Florida USA

During a visit to this school, we had the chance to see several classrooms. Perhaps the most significant one was a 4th grade class with students of around 9 years of age. When we went in, we were impressed by the commitment among a group of 26 students. Groups were working on the floor, on tables, with computers, arguing, writing, drawing, and so on. The teacher was in a corner, immersed in her own work but at the same time helping when the students came to her with questions or proposals, which she never answered or solved but merely asked another question back or suggested something that the students could do themselves to solve the problem. When we asked her what was happening, she explained that it was a project in which the students had to help solve a problem in the community of Palm Beach. The city needs a new high school, but it does not have enough space, and the only place that could be available is an area inside a public park and a natural reserve. The dilemma consisted of the need for a new high school but the only possibility of building it being inside an area that is protected to preserve the ecosystem. Since it is a real problem, the students decided to participate in the decision making. Two groups were established; the first one supported respect for the environment and not building the school in that area, and the second one decided to create a project whereby the school would be built without negatively affecting the environment. The mother of one of the students is a judge in the Palm Beach Court, and suggested taking the case to court, where the two groups of students would be able to present their cases and proposals. Each group of students was divided into research committees to be able to build the foundations to present a structured and solid case to the court.

The different student committees research:

- The park's ecosystem, native species, needs, interactions, and synergies with the surroundings.
- An "ecofriendly" design and architecture, materials, renewable energies, impact of human and motor traffic.
- Waste management or use of inert materials, recycling.

- Laws on environmental protection in the county.
- Legal system of the State of Florida.
- Functioning of the courts, protocols for presentation of cases, arguments, evidence, and the use of experts and specialists.
- Similar problems and solutions to these cases.
- The presentation of the case, plus resources and strategies to achieve credibility.
- Budget analysis, costs and economic impact of the case, and solutions.
- Management and coordination of the different committees to structure the arguments and proposals.

The students had three months before finally going to court to present their cases. In this time, they learned and understood everything that relates to the real problem that the city is facing, so that they can propose their solutions.

Case 2; Colegio Regina Carmeli, Valencia, Spain

On our random visit, we decided to go into the biology class for 12-year-olds. It was interesting to see how immersed the students were in their notebooks and computers. The teacher told us that they were studying vaccines, a topic that is explained in the textbook, so there was enough curricular material for the students to acquire the required knowledge on the topic and pass the corresponding test. What is interesting is that the students, with their teacher's support, decided to delve further into the topic to find out more about it. Multiple questions arose in the classroom from the students that wanted to learn more than what the textbooks had to say. The girls were in the process of being vaccinated against HPV, some students had pets that were being vaccinated, and one pupil had a relative with cancer and they wanted to know whether there is a vaccine for the disease. When we approached the students, we observed that they had created a routine for producing thoughtful, creative questions; they all had between 3 and 5 questions about things they wanted to learn about vaccines. They also used conceptual maps to encourage and organize their thoughts and their learning, and shared their finding on Google with each other. What is interesting about the teacher is that when approached by one of the students looking for help with the search, she answered: "you know, you are much better with

computers than me, if you need help, do a Google search or speak with one of your classmates". She informed us that she had told her students: "We are all going to learn more about this together, you might end up knowing more about the topic than me." After seeing how interested her students were and because what the books had to say on the matter was very basic and brief, she had felt it would be worthwhile to spend some more time researching and learning more.

Considerations

We should start by asking what these two cases of schools located in countries with different cultures have in common. Why are they significant and relevant in terms of learning needs in this area?

To try to answer these questions and promote reflection, we are going to use 5 of the 8 cultural forces proposed by Ron Ritchhard.

- Time; Teachers commonly comment that they do not have enough time. The question is, time for what? In general, teachers are conditioned by the time available to complete the syllabus, a chapter, or a specific topic in a specific amount of time so that the students learn, understand, and build knowledge that will allow them to keep asking questions and continue to learn.
- Opportunities; Teachers must be aware of the opportunities they generate to learn and build comprehension, mindsets, dexterities, attitudes, and behaviors, but also that students, through their own motivations, also generate opportunities that will only be taken advantage of if the teacher can identify them, value them, use them, and promote them.
- Interactions: Different researchers such as Hattie have already demonstrated the value of collaborative work, of students being able to interact with each other, to learn and develop life skills such as teamwork. Interaction also refers to the student-teacher relationship.
- The model: The teacher is aware of how his/her attitudes, actions, language, and behaviors affect and condition the context in which he/she and the students are located. Teachers model what they consider important for their students' development.
- Expectations; Researchers such as Carol Dweck have shown how teachers' expectations of their students, as well as their own self-expectations, are fundamen-

tal for the construction of individuals that successfully develop the right growth mindset and skills for life.

If we look at the two cases in terms of these five cultural forces, we can see the coincidences and how the teachers generate a context of learning in which:

- They give value to the process of constructing learning over the structured and rigid model that is so widespread at schools around the world.
- They give value to the intrinsic motivation of the student as a driver for learning.
- The students are connected with a real-life topic that touches their present lives and not just to pass a subject or obtain a grade.
- The students can use their learning and the acquisition of skills and dexterities in real life, in other words, transferred to their life outside school and outside the classroom.
- The students are protagonists of their own learning, they own it.
- The teachers are open and identify the opportunities to promote learning and the development of fundamental skills and dispositions for their students.
- The students have the opportunity to extend their learning beyond the task and to connect with other areas of knowledge.
- The teachers understand their role, they deliver autonomy, they trust their students and their ability to build such attitudes and dispositions as discipline, persistence, resilience, flexibility, and openness with a growth mindset.
- Teachers are aware of the fact that while the students are learning, they are also developing skills and mindsets that allow them to build critical, creative and strategic thinking.

Elements for consideration

1. In order for learning to be relevant, it must be meaningful to the apprentice. It must make sense to learn it, and it must connect with the apprentices' life and not just be used to pass a test.
2. We must understand that education goes beyond forming workers to feed an economic model. Even

though this is an element to keep in mind, it must not be the only one or the most important one. It is crucial for education to foster the development of individuals with internal and external balance, whose lives have sense and purpose and who build wisdom to add value to their surroundings.

3. Students should be educated in matters that are planned, implemented, promoted, and incorporated in their daily lives. For example, if we believe it is fundamental for them to develop intellectual, social, moral, and spiritual autonomy, we must strategically and explicitly generate a context and a set of actions that promote this, otherwise, it will not happen.
4. The teacher must not be the ceiling of his/her students' knowledge, but rather the promoter of the development of a comprehensive being.
5. Education has lost two fundamental pillars that contribute to the development of a human being: 1- The disposition to ask questions, and question oneself. The education system has removed the relevance of what learners ask, as if the only important question is that of the teacher seeking to verify whether his or her students are learning. The essence of a human being is to question him/herself and these questions have guided the development of humanity, the need to explain, to find reason and truth, and to understand why, how, what, who, etc. We must generate and promote curiosity, make students wonder, for this is what will make them life's apprentices. 2- The second important pillar we must recover is the right to make mistakes. There is no way of learning without failing; making mistakes is inherent to learning, and must be part of it. The traditional education system does not allow for mistakes, not only because the evaluation system only looks at the results, but because it even accepts insufficient learning. If a student is awarded a pass for getting 6 out of 10, this means that they passed with only 60% of the required knowledge. We should not be satisfied with that. Every student should achieve 100% of the proposed learning. It is not just about passing, it is about learning.

The residual of education that we must focus on in schools in the era of Artificial Intelligence

Education must focus on the development of people that seek interior and exterior balance, with a high sense of living with purpose and developing the wisdom with which they can add value to every situation they face. To do so, schools must focus on developing:

1. Highly ethical individuals, with moral and intellectual values to develop integrity and character.
2. GRIT, which is defined as perseverance and passion to achieve long-term goals. This requires determination, persistence, discipline, and resilience.
3. Growth mindset, i.e. individuals with the mental flexibility to explore different perspectives that allow them to learn all the time.
4. Development of citizenship beyond following rules and behaving.
5. Mathematical, scientific, historic, global, and artistic thinking.
6. Skills and mind dispositions (Habits of mind, critical, strategic and creative thinking).
7. Empathy, Emotional Intelligence, caring for others.

References

- Ritchhart, R., Church, M., & Morrison, K. (2011). *Making thinking routines visible: How to promote engagement, understanding, and independence for all learners*. San Francisco, CA; Jossey-Bass
- Hattie, J. A. (2009). *Visible learning. Synthesis of over 800 meta-analyses related to achievement*, New York; Routledge.
- Yeager, D. S., Henderson, M. D., Paunesku, D., Walton, G. M., D'Mello, S., Spitzer, B. J., & Duckworth, A. L. (2014). Boring but important: A self-transcendent purpose for learning fosters academic self-regulation. *Journal of Personality and Social Psychology*, 107, pp. 559–580.
- Dweck, C. (2008). Can Personality Be Changed? *Current Directions in Psychological Science*, 17, p. 391

Goleman, D. (1995). *Emotional Intelligence: Why It Can Matter More Than I. Q.* New York: Bantam Books.

Costa, A. (1991). The Search For Intelligent Life in A. Costa, (Ed.) *Developing Minds: A Resource Book for Teaching Thinking*, Alexandria, VA: Association for Supervision and Curriculum Development, pp. 100-106.

Immordino-Yang, M. and Damasio, A. (2007). We Feel, Therefore We Learn: The Relevance of Affective and Social Neuroscience to Education, *Mind, Brain, and Education*, 1(1), pp. 3-10.

What Skills and Competencies do 21st Century University Students Need?

Francisco López

Abstract

Students born at the beginning of the 21st century have new characteristics: they are digital, active on social networks, global, learn by doing, work together in face-to-face and virtual groups and they network. They prefer practical, dynamic classes, not traditional lectures. They tend to harmonise vocation with employability. They aspire to be trained for jobs that do not yet exist, to receive innovative teaching for entrepreneurs, which will lead them to get quick results in the labour market. The first generation to have grown up in a digital environment is now entering universities. The Internet has radically transformed education in just 20 years. Unlike traditional higher education, that of the 21st century and its new modalities – open degrees, double degrees, degrees in foreign languages, hybrid professions, flipped schools - demands new competences other than the typical ones of degree disciplines - mathematics, physics -; such skills as leadership, communication, languages, creativity, resilience; and ethical values, in a digital environment that is advancing exponentially. In such a scenario, Artificial Intelligence (AI) - the ability of computers to perform tasks that normally require human intelligence - and automation, are dictating their rules. According to the OECD (2019), 21% of jobs in Spain are at risk of disappearing and in the US, 47% of jobs will disappear in 15 years, according to a study at Oxford University.

At today's universities, it is necessary to learn - and/or master - not only knowledge specific to the 'professions', but above all: to learn to be enterprising; to prepare projects; to work as a team with students and teachers; to connect interactively to global and regional networks; to improve knowledge of languages such as English, Chinese, Russian, French, Arabic, Portuguese and Swahili, among others; to have an absolute command of the technological products of the digital revolution (big data, blockchain, neuro-robotics, software, cybersecurity, video games, 3D) and of the ICTs at their most advanced. It will be essential to learn generic skills beyond those of the specific discipline. Learning and permanent refreshment are essential in the knowledge society.

Challenges of Internet and Artificial Intelligence in University Education

Students born in the late 20th and early 21st century are different: they are digital, are active on social networks, are global, learn by doing, work together in face-to-face and virtual groups, and network. They prefer practical, dynamic classes rather than traditional lectures. They tend to harmonise vocation with employability. They aspire to receive innovative teaching for entrepreneurs, which will bring them quick results in the labour market.

The first generation that grew up in a digital environment is now entering our universities. The Internet has radically transformed teaching in just 20 years.

Higher education in the 21st century, unlike the traditional form, demands new skills and abilities, in a digital environment that is advancing exponentially and where Artificial Intelligence (AI) - the ability of computers to perform tasks that normally require human intelligence - is dictating rules (Table 1). AI is the ability of computers to use algorithms, learn from data and use what they have learned to make decisions just like a human being does. AI devices have superior capabilities to humans, such as permanent web connectivity and knowledge refreshment, having no need to rest and making fewer errors than humans. In 1996, it was shown that computers could perform certain tasks more efficiently than humans when IBM's computer, Deep Blue, beat chess champion Garry Kasparov. The application of AI is a priority for such leading technology companies as: Google, Facebook, Amazon, Apple, Microsoft and IBM.

The creation of robots and machines with models of human brains will imply the emergence of a new group of IA-based professions. The demand for experts in big data, neurorobotics, blockchains, and machine deep learning to converse with the machines is leading universities to develop new high-demand bachelor and masters programmes in such areas as Telecommunications and Big Data Engineering. We know that Colossus,

the fire-fighter robot, saved Notre Dame Cathedral from absolute destruction by fire on 15 April 2019. AI and accelerated automation are destroying many jobs, but they will also create new ones⁽¹⁾.

Table 1

Traditional University Teaching	21 st Century Higher Education
Sitting and passively receiving	Interaction between teacher and students
The student as a receiver	The student as an initiator
Homogeneous expectations	Diverse expectations
The teacher explains	The student builds meanings
Pencil, paper, blackboard and chalk	ICTS, Multimedia, Web, Videos
Set theoretical framework	No limits
Isolated and personal learning and study	Collaborative learning in groups
Learning with paper, books, magazines	Learning with digital and web media
Passive, docile students	Students that ask questions
Give answers	Pose questions
Closed system	Open system
Slow and gradual changes to syllabuses	Constant and fast changes to syllabuses
Teaching based on known facts	Questioning of traditional knowledge
There is only one way to do things	There is no single way to do things
Wait patiently for results	Immediate response to questions
Long duration	Modular
Degree in a single discipline	Degree in two or more disciplines
Teaching in one language	Bilingual or foreign language teaching
Learning in the classroom	Learning in the classroom, online and in-company
Learning theory	Learning to deal with and solve problems
Face-to-face teaching	Online (MOOCS), virtual or blended teaching
Based on human intelligence	Focused on Artificial Intelligence
Traditional professions	New careers

1. See articles in training dossiers published by El País, 13 May 2018 and 12 May 2019.

Traditional University Teaching	21 st Century Higher Education
Learning with rigid syllabuses	Learning on demand
Traditional studies	Vocational and second-chance schools
Education during a set period of life	Continuing education and training
Rigid hiring of teachers	Flexible hiring
Traditional assessment and certificates	Assessment and certificates based on graduates' results in market and society
Closed degree	Open degree
Disciplinary and national education	Multidisciplinary and transnational education
Content and degree focused teaching	Competencies and skills focused teaching
Little information	Rich in information
Emphasis on theories and texts	Know-how, hypertexts
Teaching 'related' to research	Interactive construction of knowledge
Traditional lectures	Flipped classroom
Traditional professions	Hybrid professions

*Table produced by the author based on own cited book (2019) and on the Table of "Innovation in university education" by the Director of IESAL, Francesc Pedró.

The Future of Work: Required Competencies and Skills

According to the OECD Report "The Future of Work" (2019), 21.7% of jobs in Spain are at a high risk of disappearing due to technological changes and 30% are at risk of major restructuring. The IESE Study (2019) "The future of employment and the professional competencies of the future", indicates that 72% of the companies interviewed in Spain have serious problems filling the vacancies they offer. 67% of jobs in these companies are taken by university graduates, although for many of them this is not a requirement.

In 2013, a study at Oxford University predicted that, due to developments in robotics and AI, 47% of jobs in the USA are at risk of being replaced by robots in the next 15 years. According to Moore's Law, the capacity of computers is increasing by 100% every 18 months. These

rapid technological advances are not only occurring in the field of computing, but also in robotics, biotechnology and nanotechnology.

This implies that the skills and competencies taught at universities need to respond to these challenges. A possible 'universal basic income' in response to the impending mass unemployment will only be an extreme measure to prevent huge social conflicts, as evinced by such movements as the yellow vests in France, among others.

Lifelong learning and permanent refreshment is the only thing that can save us from unemployment in an era of such rapid change. This would also avoid a new form of illiteracy and make sure we all have 'modern scientific literacy', which implies digital, linguistic, informational, scientific, technological, electronic and other forms of literacy. Only through this new form of literacy (and not only traditional literacy in terms of knowing how to read and write) can we simultaneously guarantee an increase in specialised human

capital, national and global scientific-technological development, democratic participation, sustainable development, a reduction in inequality, peace-building and the prevention of technocratic hegemony.

Lifelong learning and permanent refreshment is the only thing that can save us from unemployment in an era of such rapid change. This would also avoid a new form of illiteracy and make sure we all have 'modern scientific literacy', which implies digital, linguistic, informational, scientific, technological, electronic and other forms of literacy

Brexit and the election of President Trump are associated with this mass exclusion of workers due to AI and automation, as are the 'yellow vest' protests and the rise of right-wing populism worldwide.

Universities should not only offer the specific *competencies* of certain degree subjects (mathematics, physics, health sciences, engineering, architecture, business management, finance, economics, international relations, negotiation techniques, computer science, software, big data, sociology, design, etc.), but also soft *skills* such as leadership, communication, languages, creativity, persuasion, resilience and time management. It is important to note that soft skills do not usually become obsolete over time like technological skills do.

They must also offer thorough training in ethical values and suitable education for graduates to contribute to compliance with the 17 Sustainable Development Goals adopted by the United Nations in 2015.

At university today, students must not only learn (and/or master) the specific knowledge of the 'professions', but above all must also: learn to be entrepreneurial; prepare projects; work as a team with students and teachers; interactively connect to global and regional networks; improve their knowledge of languages such as English, Chinese, Russian, French, Arabic, Portuguese and Swahili, among others; be in absolute command of the technology derived from the digital revolution (big data, blockchains, neurorobotics, software, cybersecurity, video games, 3D, etc.) and the most advanced forms of ICTs. In short, it will be essential for them to learn generic skills beyond what is specifically disciplinary: learning and permanent refreshment are essential in the knowledge society. The obstacles to fulfilment of these goals are enormous at our Iberian-American universities, where, despite the advances, scientific and technological culture (especially in Latin America and the Caribbean) still needs further develop-

ment. Refreshment, innovation and mastery are much more difficult in undergraduate studies, while progress in terms of modernisation and refreshment is happening much faster at the postgraduate level.

UNESCO Conferences and the GUNi Reports: A Toolbox

The Regional (1996, 2008, 2018) and World (1998, 2009) UNESCO Higher Education Conferences, and the GUNi Reports, offer us a valuable toolbox to meet these modernisation and refreshment goals. However, UNESCO member states, whose representatives sign the declarations at these UNESCO conferences, often have too little political will to comply, through ad hoc laws, with this commitment to building university education as a public and social good. That is why long-lasting state policies are needed, through ad hoc state agreements that are immune to the fluctuations caused by changes in the political parties in power, in order for state policies and proper funding not to be affected by changes in government.

How Can We Train Students for Professions that Don't yet Exist? The University Mission

The challenge today is training students for new professions that do not even exist yet when they begin their courses, but that they will encounter on graduation; and for the changes faced by those that do not disappear altogether due to the effects of the likes of AI. This implies a generalist kind of university education that is, at the same time, focused on exact profiles, in order to guarantee that after their studies end, graduates receive continuing forms of face-to-face, mixed (blended), or online education.

The challenge today is training students for new professions that do not even exist yet

Universities, and especially Latin American ones, have a long way to go, despite the unquestionable advances, in teaching the cross-cutting and soft skills required to foster and increase employability.

An addition to the inherent competencies of degrees, students also need cross-cutting skills for a digital environment. They must learn about preparing projects, speaking in public, leadership and working in groups of students from their university, elsewhere in their country and from abroad.

Universities must be innovative institutions that are closely linked with triple and quadruple helix projects in society, the market and the state, through research, innovation and knowledge transfer, in an environment in which course material and knowledge are constantly refreshed. Latin American universities are way below Anglo-Saxon ones in the rankings, and although many of the indicators used in said rankings are debatable, and although our public universities (and even some private ones) have many virtues, that is no reason to disregard the Anglo-Saxon, French, German, Russian, Chinese, Japanese and other experiences, both in the field of technical and vocational education and in that of university education.

One of the biggest contributions by Anglo-Saxon universities is the way that they work with businesses to produce syllabuses, ensure students do internships with companies from an early stage and benefit from legislation that encourages donations to universities in exchange for tax benefits.

Every year, 12,000 Spanish students take university courses in the United Kingdom, especially to study Business Management and Administration, and to a lesser extent Engineering, Architecture, Social Sciences, Biological Sciences, Creative Arts and Design. Certain experts on higher education in Spain claim that the British university system has three advantages that the Spanish one lacks: it is highly practical and involves a lot of personalised support; the dropout rate is very low; and the percentage of graduates that find employment is high, 86%.

That does not mean that we consider that their forms of funding, based on student loans assumed by the students themselves, or their parents' savings, are better than our funding methods, or than our Iberian-American 'national public research universities' that do so much to reduce inequality.

In addition to the *university missions* of teaching, research and extension, as described by Ortega and Gasset in "Mission of the University", a new dimension of extension should be added - transfer of innovation

to society and businesses - as well as a fourth mission that puts special emphasis on training citizens who are concerned about environmental sustainability, reducing inequality and permanent peace-building. Some authors who agree that education (first mission) and research (second mission) are still key missions of universities, rightly emphasise a third mission that consists of developing innovation systems and being able to transfer their research to the business and financial system to create value, foster innovation and ultimately promote social progress and economic competitiveness (Vilalta 2019: 168, 436).

Digital Revolution, Vocation and Employability

The digital revolution implies that university professors need to acquire new skills and competencies rapidly, constantly and permanently in order to respond to the challenges and demands of new digital students and the speed of change. This implies interdisciplinary training, with the aim of promoting and putting into practice scientific research actions in Higher Education, technological development and transfer to the field of education.

Courses given in several European countries (ERASMUS), or partly in Europe and partly in countries such as the USA, have been shown to improve graduate employability⁽²⁾. *Double degree* courses are increasing rapidly in number, but a very good knowledge of English is usually a prerequisite to be able to take them. Senior Spanish executives have problems with English language skills: only 77% of them are good enough at this language to serve their functions, while in Switzerland the figure is 99%, in France 95% and in Mexico 93%. In the field of finance, the problem is even more worrisome: only 58% of Spanish financial executives have the necessary level of English.

One form of degree that is on the rise in tertiary education - influenced by the Bologna Plan, the demands of the labour market and the Anglo-Saxon model - in Europe and especially in Spain and Catalonia (Pompeu

2. The Erasmus + programme, launched in 2014, has 14,700 million euros and allows European students to study in different EU countries. It provides student grants of some €300 a month. Spain, with 40,000 scholarship holders, is the European country that receives the third highest number of students, behind France and Germany, and provides the highest number.

Fabra University), is the *Open Degree*. The student is trained in several subjects for 4 terms and then goes on to their Destination Degree. In the third term, the tutor guides the student towards that Degree. In addition to the tutor, who belongs to the university faculty, there is also a mentor: a student studying for a higher degree who has already gone through the Open Degree system. This method allows students to fit their curricula to their preferences. The subjects studied on courses that are not continued are not lost time. The credits obtained count towards the selected degree.

One of the dilemmas faced by university students today is matching *vocation and employability perspectives*. The tendency in many cases seems to be to prioritise the latter. It is important for universities to have an academic guidance department to assist, accompany and redirect the student.

One of the dilemmas faced by university students today is matching vocation and employability perspectives

The professions of the so-called 4.0 industries - AI, Internet of things, nanotechnologies, renewable energy, quantum computing and biotechnology, among others - and STEM (science, technology, engineering and mathematics) guarantee a high level of employment. However, in the case of Latin America, there is a serious lack of STEM opportunities for young people.

There is a close correlation between *level of education level and employability*. According to the OECD figures in "Trends in employment rates of people aged 25 to 34, by educational level reached (2000, 2005, 2010, 2015 and 2016)", in 2016 less than 60% of people that completed less than upper secondary education were employed in most countries; those that completed upper or post-secondary level tend to be employed in between 70 and 80% of cases in the vast majority of OECD countries; and over 80% of young people with tertiary education were employed in almost all countries (OECD 2017).

According to ECLAC, in Latin America urban unemployment especially affects young people between 15 and 24 years of age (16%) and the age group that it least affected is that of people over 45 years of age (6%). Meanwhile, people that studied for more than 13 years have lower unemployment rates (less than 6%) than those that only studied for a few years (CEPAL 2018: 21).

While university enrolment rates are above 80% in North America and above 60% in Europe and Central Asia, in other continents they are below 50%. In Sub-Saharan Africa the figure is just 8% (World Bank 2018; UNESCO 2019).

In developed countries with lower poverty rates, more years of schooling and higher university enrolment rates, unemployment is usually much lower than in developing countries. The unemployment rate of university graduates is 47% in Nigeria and 33% in India, while in Germany it is only 10% and in the United Kingdom it is 5% (López 2019: 146).

The employment rate of recent university graduates in EU countries in 2017 was above 70%, except in Croatia, Italy and Greece. The EU average is an 80% employment rate of recent graduates.

Vocational Training

Another form of education that has been perfected over time, pushed by the fourth industrial revolution, is *Vocational Education and Training (VET)*, which offers courses and apprenticeships aimed at employment in certain trades. It is a training system that is just as valid as university education, and which is characterised by its practical nature and proximity to businesses.

VET offers shorter duration courses than university degrees, enrolment fees are affordable and students are ready for work more quickly. In addition, the relationship with teachers implies that the class acts like a work team from the outset. Such education also offers the possibility of doing internships abroad, as well as recognition of certificates in Europe. It can be *Initial*, for pupils in the school system who are looking to find work; *Occupational*, which aims to reintegrate the unemployed in the labour market; and *Continuous*, aimed at active workers that are looking to acquire better, refreshed skills.

According to the European Center for the Development of Vocational Training (Cedefop), from 2019 to 2030, 65% of jobs created in Spain will be in VET modalities and only 35% will be associated to *Formación Profesional de Grado Superior* (pre-university) or university degrees.

Hybrid Professions and Virtual Teaching

It can already be appreciated that VET and university education are starting to generate *hybrid professions*. These are jobs filled by employees that have taken traditional degrees, but who also have digital skills such as Big Data, cybersecurity, video games, 3D, and the internet of things, for example. There will be an increase in degrees that combine different disciplines, from sustainability to the gender gap. Another example is that of industrial engineers who take a postgraduate degree in finance. Degrees such as software engineering and bioengineering are in high demand. There has been an increase in *double degrees* in the countries of the European Higher Education Area (Bologna), some typical of the Anglo-Saxon system plus other new forms, the ones in Spain including Tourism-Commerce; Mathematics-Physics; Law-Philosophy; Law-Business Administration; Law-Political Science; Business Administration and Management-Computer Engineering. Normal degrees last four years, but these double degrees usually last for five.

There has also been an increase in Masters in International Business and East Asian Studies, and especially on China. Bilingual learning is offered, and some courses are taught fully in a foreign language, usually English. When recruiting staff, many companies prioritise a good command of English over a formal degree, even a master's degree. Some business owners would rather hire an executive with an excellent command of English or Chinese than a graduate with a master's degree. These flexible, complex forms of hybrid professions that require good language proficiency offer a new way of learning that is in high demand among new students, as well as companies looking to meet new challenges. In Catalonia, for example, 71% of the masters courses in 2019 are being taught in foreign languages, especially in English.

Masters and other postgraduate degrees in Corporate Social Responsibility are also in demand, offering an education in environmental, social and governance issues. The essential objective of these innovative forms of education is to offer society and businesses a new kind of professional, typical of the fourth industrial revolution.

Another form of hybridization is that which has occurred between classroom and virtual education, giving rise to a mixed kind of teaching called *blended learning*. These courses are part face-to-face and part virtual.

Lecture-based education, where the classroom was a learning environment, but not one for reflection and much less so for applying what had been learned, has given way to hybrid forms of teaching where digital and online elements are of major importance. *Flipped schools* (Salman Khan) have even been created, which is a form of teaching that has reached universities, and involves the student acquiring knowledge via digital platforms, and classrooms instead being places for debate, reflection and applying the new knowledge acquired from the web. This brings students closer to what they will be doing in a working environment.

Virtual (online) education is advancing exponentially. In 2018, 100 million students took one of the 11,100 existing online courses at more than 900 universities. Online education is not cheap. The production of one hour of an online course can involve from 100 to 160 hours of work and can cost between 7,000 and 33,500 euros.

Online courses (or otherwise master's degrees) in cloud computing, big data, internet of things, digital health, application development, robotics, marketing, corporate social responsibility, sustainable development, and others, provide students that already have a profession (mathematicians, physicists, engineers, finance or business administration graduates, etc.) with the kind of flexible, accessible and emerging knowledge that is increasingly more in demand and much better paid than non-hybrid professions. These courses, when combined with the different competencies and skills that the professional already has, imply a merger of business and technological experience or a mixture of hard skills (mathematics, physics) and soft skills (leadership, communication).

The Transformation of Universities

Another feature that reveals a greater concern for the skills and competencies required by the students of the 21st century is the *development of strategic plans for the transformation of universities, their mission and vision*. Public universities are competing with the marketing clout of privately funded ones by showcasing the excellence of their faculty's teaching and research and their projects to improve society.

Of the 87 universities in Spain, 50 are public. The number of degrees offered has increased by 19% in the

last decade, but it is obvious that the marketing effort to attract students has been better among private universities, which have doubled their number of students in 10 years, while public ones have lost 12% of their students in the same time. However, the Spanish Conference of Rectors (CRUE) has pointed out that public universities have suffered a drop in funding of 4,530 million euros since the 2008 crisis. Other estimates calculate a 20% loss in public funding between 2009 and 2015. The diversification of degrees in the public sector has not been able to increase enrolment, but has increased the costs. Although the rule is that the highest quality is that offered by public universities, they may not have been as quick to create recognised professions with such good job opportunities as those of private universities.

We are facing the following choice: an increasingly unequal world, with wars and pollution; or a more supportive, egalitarian, peaceful, democratic and sustainable one. Higher education will play a key role in fostering the values of a culture of peace.

References

- CEPAL. (2018). *Statistical Yearbook For Latin American and the Caribbean, 2018*. <https://www.cepal.org>
- López Segrera, F. (2019). *Prospectiva de la educación superior en el mundo*, Barcelona: El Viejo Topo, Barcelona.
- OECD. (2017). *Panorama de la educación*. Indicadores de la OECD
- OECD. (2019). *The Future of Work. OECD Employment Outlook 2019*. Paris: OECD Publishing. Doi: <https://doi.org/10.1787/9ee00155-en>
- Vilalta, J.M. (2019). *Construint la Catalunya del coneixement (1985-2015)*, Editorial UOC: Barcelona.
- World Bank. (2018). *Our World in Data*. UNESCO Institute of Statistics, 2019. <http://uis.unesco.org/en/topic/higher-education>

What Can Universities Do About the Future of Work?

Michael A. Peters

Abstract

In the 'age of digital reason' anything that can be automated, will be. Labor is disappearing as a factor of production with the development of artificial intelligence and application of intelligent systems, leading to the prospect of technological unemployment. What, then, is the role of higher education in an era of automation? One traditional response based on creative policy work is to expand the third sector and educate for self and community employment. A second, neoliberal, approach is education for digital skills to equip children (and adults) for the (shrinking) digital economy – warehouse education for Big Tech. A third response focuses on augmented intelligence to increase and develop machine-human learning with ultimate control by humans. AI can achieve data analysis and calculations at the speed of light, feeding back the data in a managed form with deep configurations and patterns that would take teams of humans many months, if not years, to complete, thus transforming global research into data-driven science. The fourth response is based on the assumption that the relationship between labor and payment is historically broken, or about to be broken, and that, in particular, there is no guaranteed ongoing relationship between education, labor and wages or salary. Only when the university confronts the possible harsh reality of this event ('disrupted history') will we learn how much of the modern world economy and its psychology is tied to the concept of labor and how higher education must lead new visions of 'workless' capitalism based on new welfare and equity distributions.

Introduction

The nature of capitalism is changing to a fully global-scale digital economy that constitutes a single planetary system, shifting from an oil-gas oligarchy to a bio-informational configuration that continues the long evolving historical trend of formalization and mathematical modeling based on developments in algebra, digital logics and algorithms. This is the concept of

digital capitalism that emerged from the military, government and education research networks that gave birth to the internet in the early 1990s. Now, less than 30 years later, it sports a handful of soon-to-be US\$1 trillion 'information' platform companies in both the US and China – Amazon, Microsoft, Apple, Facebook, Alibaba, Tencent, We-Chat.

This is 'the age of digital reason' – anything that can be automated, will be. This simple realization is based on the understanding that labor is disappearing because in digital or algorithmic capitalism, the capitalism of 'intelligent systems', labor is no longer a factor of production. In the age of industrial capitalism, agricultural or farm labor disappeared as a result of mechanization; in the age of 'intelligent capitalism' based on the development and application of intelligent systems, jobs in manufacturing and services are disappearing and will continue to do so.

McKinsey's 2017 report *Artificial Intelligence: The next digital frontier* begins with the following: "Artificial intelligence [AI] is poised to unleash the next wave of digital disruption, and companies should prepare for it now. We already see real-life benefits for a few early-adopting firms, making it more urgent than ever for others to accelerate their digital transformations." McKinsey focuses on five AI technology systems: robotics and autonomous vehicles, computer vision, language, virtual agents and machine learning, which includes deep learning and underpins many recent advances in the other AI technologies. While AI technology systems are critical for future development, it is clear that quantum computing is another revolution in computing in its early stages.

The McKinsey report recognizes how digital capitalism is now dominated by the global giants such as Google and Baidu that spent a combined US\$20 billion to US\$30 billion on AI in 2016, mostly on R&D, and suggest that there are real advantages for early adopters. The report is limited in that it does not comment on the loss of employment or the role of government, but simply focuses on the transformation of industry and productivity.

Mark Purdy and Paul Daugherty's 2017 report *Why Artificial Intelligence is the Future of Growth* considers AI as the missing element that will affect the future of growth. Capital and labor as the "factors of production" will give way to a transformative set of technologies known as AI, which can be considered a capital-labor hybrid where "AI can replicate labor activities at much greater scale and speed, and even perform some tasks beyond the capabilities of humans." Purdy and Daugherty (2017) suggest that AI can also take the form of physical capital such as the robot and intelligent machine with the additional capacity to improve its capabilities over time through self-learning capabilities. On the basis of their modelling and analysis, the authors claim that AI can be considered a new factor of production with a transformative effect on growth. While the effects will be determining for productivity as they develop and are adopted over the next twenty years they will also create a "jobless future".

Unemployment

By 2019, more than 212 million people will be out of work, up from 201 million now, according to the International Labour Organization's (ILO2015) report, *World Employment and Social Outlook: Trends 2015*. The ILO predicts income inequality will continue to widen and that already the richest 10% earn 30% to 40% of total income, while the poorest 10% earn around 2% of total income. The ILO has warned of the severe consequences presented by automation and disruptive technologies, but few agencies have raised questions about the ontological or subjective basis for work, its declining importance for capitalism since the symbolic, financial and algorithmic turns, or indeed the social and psychological prospect of "workless" capitalism.

Under the systematic adoption of "intelligent systems" in manufacturing, is that labor in the historical process of disappearing? What then becomes the role for higher education, when most of the world's education systems, and especially since the advent of neoliberalism, have been conceived increasingly in labor market terms?

'Intelligent systems' draw on machine or "deep" learning to mark the end of labor and the final stage of automation. The term "intelligent manufacturing" was first used in the 1980s by Purdue University and the United States released a monograph describing the process as "the process of making use of technologies about knowledge engineering, manufacturing software and robot

visual for intelligent robots to accomplish a batch of production missions without artificial interventions".

The evolution of smart manufacturing through AI has given rise to a new version of intelligent manufacturing based on smart technologies such as the internet of things, cloud computing, cyber-physical systems and big data on Industry 4.0. In China, the "Made in China 2025" strategy, based on the German model, has forged ahead with investments in a set of strategically related technologies, including deep learning, AI and quantum computing. In a workless industrial society, what are the possibilities for education when the link between education and labor is broken once and for all?

Higher education in an era of automation

It is not clear what function higher education will serve in the era of "final automation" once the vocational justification is removed. As a thought experiment it is useful to contemplate: What is the purpose and function of education in the age of final automation once labor as a set of processes and as a political category has disappeared? (Peters et al 2019). Once the purely utilitarian options become more difficult to pursue and the general ethos of education for work begins to falter, other possibilities will depend upon creative policy work.

In this response that we might call 'community' or 'third sector', there are many possibilities that will develop out of existing initiatives and practices. In effect, this will signal an ethos of the recognition of the diversity of work practices and concerns about the quality of work and job equity. The university can contribute in this area in terms of reshaping curricula to better partnership with the "third sector."

The second neoliberal response is to define education in digital skills that equip children (and adults) for the (shrinking) digital economy – more programmers, more internet developers, more entrepreneurial platform providers, 'digital literacy', more ed-tech, more technicians, more gaming, etc. This strategy relies on the largesse of the new soon-to-be trillion-dollar digital providers (Please come here! We offer tax advantages!). It is a strategy that buys into the forces that create the dangers of a laborless and workless society, hastening the prospect of unpaid and free labor while further aggrandizing the status of the US 'big five'. The American techno-state model will be

challenged in terms of market expansion by Chinese internet companies. China, which owns 20% of the internet and 25% of subsea internet cables, represents a different parallel market, and State-led investment may operate very differently to the Western experience.

Figure 1. Creating New Employment Opportunities

- The expansion of the “third sector” based on corporate-government-community partnerships with greater regional autonomy;
- The greater importance of regional councils, communities, and voluntary organizations to develop work schemes;
- The revival of DIY job cultures, and government sponsorship of self-employment initiatives and small cooperatives;
- The growth of small businesses and self-employment, especially in food, hospitality and other industries;
- Intensification of all competitive talent programs in sport, fashion and entertainment;
- Large-scale corporate and government sponsored survivalist and cooperative living programs;
- The re-cultivation of traditional arts and crafts, and the crafts sector;
- The encouragement of all forms of openness including open access, open science, open publishing and open education;
- Increasing development of second-hand markets, waste management and eco-industries, including recycling and sustainability industries (the “green economy”);
- An environmental education that monitors resource depletion and water and air quality at the local level on the basis and encouragement of citizen science projects;
- The revival of liberal arts education with an emphasis on collective processes that aid citizenship and imagination. Education for design, media and creative arts that encourage a raft of new platform initiatives that understand the “creative economy”; and environmental and global citizenship projects.

In crude versions, education simply becomes a digital factory or warehouse serving the digital economy, probably with an emphasis on digital job creation and use of platforms to launch new digital services and mobile apps. This is the no-frills neoliberal response that settles for the easy answer. According to this option, some policy pundits will ask “why not simply let the big information utilities run education”, either privately or in conjunction with the state? The philosophy is that we live in a digital world, we are digital citizens, so let’s make digital boys and girls so they can grow up to be digital adults.

This is not to say that this digital response is unrealistic. It is probably a strong and likely response, but philosophically-minded policy scholars need to come to grips with the larger questions about forms of digital labor and questions about digital citizens and digital beings (or rather digital becomings) (Peters & Bulut 2011). Ultimately, this option depends for its credibility and legitimacy on investigating and critiquing “bio-informational capitalism” (Peters, 2008) – is it a new kind of paternalistic capitalism that envelops its workers from “cradle to grave”? Is there any way to responsabilize global Big Tech in relation to workers and employment law?

Machine-human learning

The third response is focused on *augmented intelligence* and uses machine-human learning and controls directed by humans. AI can achieve data analysis and calculations at the speed of light, feeding back the data in a managed form that recognizes deep configurations and patterns that would take teams of humans many months, if not years, to complete. This is increasingly true, for instance, of global cancer research where IBM’s Watson can ‘read’ and analyze millions of research papers, which is impossible for human beings to do. This accommodation works as an augmented system that combines elements from both worlds – the data analytical tools of machine learning and deep learning on the one hand, and the creative intelligence of design engineers or technologists on the other.

It tries to achieve a new and comfortable working relationship between AI and human beings in the world of work and promotes or profiles this sector as a preferred future that means making the necessary social and political arrangement for the harmonizing of humans and machines with legislation to regulate the ethical issue

of who controls whom and, of course, data management and privacy issues. This area requires a lot more research to examine models of harmonization at the firm and individual level. One aspect might be that the augmented intelligence option is pursued and supported if it shows the generation of new forms of employment.

The fourth response is based on the assumption that the relationship between labor and payment is historically broken, or about to be broken, and that, in particular, there is no guaranteed ongoing relationship between higher education, labor and wages or salary.

It is only when the policy scholar confronts the possible harsh reality of this event (“broken history”) that will we learn how much of the modern world economy and its psychology is tied to the concept of labor. (For the moment we will use labor and work as interchangeable, knowing that Hannah Arendt makes an important distinction). This “broken” economic and psychological link will not happen immediately but will happen first for large groups of unemployed youth.

Permanent unemployment?

Already 20%-30% of youth experience unemployment in some Mediterranean economies. But what would it be like for such groups to experience unemployment as a permanent condition? This profound existential question that refers to identity issues and also to societal institutions must be rethought at a philosophical level. Only if this question is treated philosophically can ‘we’ workless peoples of the future then begin to hypothesize the other positive side of unemployment – and not just the old 1970s notion of ‘the leisure society’ where, benignly, machines do all the drudgery work, leaving us humans to pursue the higher creative arts. In this third response, it makes sense first to examine the influence of laboring and working as a concept that controls the household domain of everyday survival, of going to work or working from home.

The concept of work defines our everyday life – our working lives, but also our family life, including household arrangements, meals, homework, weekends etc. So much of our individual identities is tied to the concept of labor. Some thinkers define us – our very being in its essence – in terms of labor. If this was ever true it was true of the industrial age. In the advanced knowledge economy of convergent digital technologies driven by

digital giants, our nature is more plastic and tied to the social recognition of new media ecologies. Universities will have to revive the concept of “labor studies” and take seriously their role in relation to the changes in the global scale adoption of intelligent systems that have the power to restructure the internal research, teaching and administrative functions of the university as well.

From Industrial to Digital Society

The philosophical reappraisal of the concept of work is a way of rethinking the concept of the “laboring society” that characterized industrial conceptions of work and society. On further reflection, much of the current anxiety has been expressed in predictions, but few responses have ventured into the much more difficult terrain of imagining a different kind of society where work and the institutions it structures (unions, politics, education, retirement, etc.) might be institutionally re-written. Despite the rapid growth of information services and adoption of new intelligent technologies, we still inhabit an industrial landscape based on industrial attitudes, defined through industrial ontologies and subjectivities.

Industrial society is based on an economic mode of production that relies primarily on a concept of work defined by machine technology for the production of industrial goods. In one sense the characteristic features of industrial society experience a cultural lag when it comes to new social institutions that are structured through intelligent technologies. By intelligent technologies, I mean new wave technologies that create platforms for new applications – 5G mobile networks, convergent genomic and information technologies that are combined at the nano-level – “bioinformational” – that are pushing cognitive technologies, and quantum computing. The digital is not a simple substitute for the industrial but the digital does offer a generalized online “solution” to industrial institutions that emphasize decentralized, personalized, citizen “spaces” based on the co-creation and co-production of symbolic public goods. It is a model that to some degree characterizes social media as based on connectivity with friends (and others), user-generated content, custom-based individual profiles, integrated features that encourage interaction, instant communication, all of which provoke engagement. The type of new institution based

on social media is hence very different from industrial media that broadcast one-to-the-many. In its ideal form, the new institution is many-to-many, interactive and constituted through forms of social exchange.

Part of the problem is that the economic definition of work has changed and is changing rapidly but the social institutions that developed around the industrial concept of work are much slower to change or evolve. There is a degree of institutional inertia or cultural lag. The industrial revolution that was based on steam soon gave way to a new round of technological change that utilized electricity and the internal combustion engine and permitted the development of heavy industries. One consequence in the history of labor was its industrialization, the consequences of which we are still living

Figure 2. The future of work



through. Specifically, the world of work is changing as a result of three simultaneous tectonic shifts as depicted below (Vos 2018).

1. A *demographic shift*, including an aging population that is living longer combined with a declining population in full employment. The population bomb takes place when the employed can no longer support those unemployed. Mass migration becomes an important young labor reservoir and work is no longer seen by the young as essential for self-definition and instead they seek better work-life balance.
2. The *economic shift of digital globalization* that creates massive global commodity markets especially for cultural goods that can be accessed digitally with same-day delivery; financialization as the accelerated growth of the finance sector, deregulation and the development of leverage, debt economy and financial derivatives, with effects on the political system endangering representative democracy.
3. A *technological shift* driven by the internet and internet platforms, including robotics, artificial intelligence, ‘big data’, 3D-printing; and bio-algorithmic capitalism bringing together the twin forces of genomic science and information at the nano-scale to produce a new scientific unity and a form of technology convergence that will drive 5G mobile technologies over the next decade.
4. A *Democratic shift* because in the West it includes the contemporary shift to alt-right and far-right politics (and disregard of welfare politics), the growth of white supremacist parties that are militantly anti-immigration; the breakdown of the two-party system with clear winners and growth of negotiated coalitions (often with strange partners) and highly labile floating day-to-day political issues; democratic deficits and lengthy hide-bound stand-off decision-making (Peters 2019).

Figure 2 is an attempt to capture the new ecology of work, and especially the digital economy with attention to 5G mobile networks and a set of accelerating synergies represented by technology convergence that emphasizes a semiological system in which everything speaks. In this new configuration, there are pronounced risks of poverty and social inclusion and emergent atypical forms of employment, including insecure contracts, and new models of outsourcing, leaving workers without adequate employment and social protection. At the same time, in the digital economy there are new forms of “platform”, “collaborative”, “sharing” and “gig” economies that

are well suited to the resurgent knowledge economy in higher education, health, and social services.

In this transformed digital context the notion of Work 4.0 was introduced in 2015 by the German Federal Ministry of Labour and Social Affairs (BMAS) to discuss changes in association with Industry 4.0 and the widespread adoption of principles of “intelligent manufacturing”. The concept of Work 4.0 is that work has gone through four phases beginning with the birth of industrial society and the formation of the first worker organizations that developed in the late 18th century (Work 1.0). In the 19th century, Work 2.0 was organized through mass production and the development of trade unions that engineered an institutional compromise of labor with capital under the welfare state, committed to policies of full employment. Since the 1970s, Work 3.0 emerged through a stage of globalization, industrial outsourcing and first stages of digitization. Work 4.0 is distinctive in terms of use of internet-based ‘intelligent technologies’, new forms of work through digital platforms, the rise of flexible employment regimes, and novel human-machine augmentation. The German Federal Ministry of Labor and Social Affairs’ (2017) White Paper ‘Work 4.0: Reimagining Work’ is perhaps the best developed concept of the social partnership directed at the question: “how can we preserve or even strengthen our vision of quality jobs and decent work (Gute Arbeit) in an era of digital transformation and societal change?” (p. 9).

As the report summarizes: “Social partnership, co-determination and democratic participation in shaping working conditions are core elements of Germany’s social market economy, a stabilising force in times of crisis, and a factor for success in the face of international competition” (p. 11). This is the vision promoted in Germany to cope with “digital structural change” aimed at the need ‘to reach a consensus in society on the future of the welfare state and its social security systems. The concept of “digital structural change” traces the shift from analog to digital technology and the rise of mobile devices in an era where digitalization permeates much of everyday life, value creation processes and work creating new “tipping points” enabling new applications.

China tech guru Kai-Fu Lee (2018) suggests a jobless future is coming, and we must prepare now. His book *AI Superpowers: China, Silicon Valley, and the New World Order* indicates that there are two separate techno-ecosystems – American and Chinese – and they operate in different but parallel universes. In the interview he sug-

gests: “It’s not just a language issue. It’s about research patterns, payments. It’s about your affinity for the brand, your belief in the company and all these other things combined. So these two universes aren’t bound to collide any time soon”. This underlines the difference that history and culture make: the European experience and the development of the welfare state in the West (followed by neoliberalism) is very different from the experience of China. Perhaps, we can also talk of differences within the West between USA and Europe. This historical difference that determines modern employment culture will make a huge difference to proposed solutions. What is clear is that in terms of techno-systems there are two distinct systems dominated by giant digital players that do not mesh. When questioned on automation and its effects he suggests that in 15 years 40–50% of current jobs will disappear but the problem is considered to be that of the CCP rather than business. Yet in terms of jobs he suggests “creativity” and “compassion”, that is, students should be able to follow their talents from an early age and others in human services and interaction to care for others.

What this brief discussion indicates is that there will be no universal solutions to job losses. It highlights that the rate of job loss will differ over time, and that history and culture also play a role in imagining acceptable solutions, so that, for instance, welfare state regimes in the West will approach solutions in terms of the history of the commitment to workers’ rights and to employment security. Yet even within these historical confines much will be determined by the emerging techno-systems that are controlled by the nine big tech companies – six American, and three Chinese – that are overwhelmingly responsible for the future of artificial intelligence: Google, Amazon, Microsoft, Apple, IBM and Facebook (in the US) and Baidu, Alibaba and Tencent (in China). The geopolitical development of two separate systems will also have a strong impact on both job losses and alternative societal visions. Higher education is a key sector not just for renewing and rethinking the link between education and jobs, but also provides the opportunity to re-examine its own status as the modern research university that was invented for industry and productivity. The university itself is an industrial institution and needs to rethink its role, philosophy, and its modes of delivery in the digital environment (Peters & Jandric 2018).

Recommendations

1. Universities need to reexamine the nature of their institutions in relation to the transition from an industrial to digital society and in particular the relationship between higher education, the economy and the future of work.
2. Universities need to reflect carefully on whether they continue to encourage a vocationally oriented professional education in a shrinking job market where traditional jobs are disappearing.
3. Universities need to think carefully about the curriculum in higher education and to develop non-traditional subjects that can assist with societies that are facing the prospect of technological unemployment.
4. Universities need to theorize the new digital technologies not only in terms of developing new administrative systems but by adopting a critical social conscience for an age characterized by Big Tech monopolies – (from Big Science and Big Data to Big Tech).
5. The digital university raises complex ontological, epistemological, ethical, social and identity issues which arise from digital technologies, but are not determined by them. Teachers, students and researchers in the digital university need to firmly take up responsibility and address this issue for the benefit of humanity and exploration of what it means to be human here and now.
6. The university needs to embrace the collaborative approach to creation and dissemination of knowledge, based on various kinds of openness, which can be roughly described by the concept of “knowledge cultures” and devise ways of taking an active role in developing a sustainable and humanist approach to digital labor, inside and outside of the university.
7. The university needs to redefine the notion of the public sphere and to develop various approaches to digital well-being and solidarity.

References

- ILO. (2015) *World Employment and Social Outlook: Trends*. https://www.ilo.org/global/research/global-reports/weso/2015/WCMS_337069/lang--en/index.htm
- Lee, Kai-Fu (2018) *AI Superpowers: China, Silicon Valley, and the New World Order*. Boston: Houghton Mifflin Harcourt.
- McKinsey Global Institute (2017) *Artificial Intelligence: The next digital frontier*, <https://www.mckinsey.com/-/media/McKinsey/Industries/Advanced%20Electronics/Our%20Insights/How%20artificial%20intelligence%20can%20deliver%20real%20value%20to%20companies/MGI-Artificial-Intelligence-Discussion-paper.ashx>
- Peters, Michael A. (2008) Bio-informational capitalism. *Thesis Eleven*, 110(1), pp. 98-111.
- Peters, Michael A. & Bulut, E. (2011) (Eds.) *Cognitive Capitalism, Education and Digital Labor*. New York: Peter Lang.
- Peters, Michael A. & Jandric, P. (2018) *The Digital University*. New York: Peter Lang.
- Peters, Michael A., Jandrić, P. and Means, A. (2019) (Eds.) *Education and Technological Unemployment*. Singapore: Springer.
- Peters, Michael A. (2019) Beyond technological unemployment: the future of work, *Educational Philosophy and Theory*
- Purdy, M. & Daugherty, P. (2017) *Why Artificial Intelligence is the Future of Growth*, https://www.accenture.com/t20170524T055435__w_/ca-en/_acnmedia/PDF-52/Accenture-Why-AI-is-the-Future-of-Growth.pdf
- The German Federal Ministry of Labor and Social Affairs (2017) White Paper *Work 4.0: Reimagining Work*, https://www.bmas.de/SharedDocs/Downloads/EN/PDF-Publikationen/a883-white-paper.pdf?__blob=publicationFile&v=3
- Vos, M. D. (2018) Work 4.0 and the future of labour law, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3217834

Fit for future - Skills for Next Generation Learners in a Sustainable Digital World

Zeinab El Maadawi

Abstract

Digitalization and sustainable development for a climate-resilient future necessitate relevant transformation of the education system and learning in the workplace. The rapid advancement of automation and artificial intelligence provides new business opportunities but also carries challenges to education and training. Four main categories of skills are required to help the next generation of learners adapt to the rapidly changing world. Digital and technological skills are core requirements for persistence in increasingly digital work environments. Intellectual skills are still a distinguishing feature for competitiveness. Socio-emotional skills are distinctive for human-centred business and economic models. Ecological skills based on learning for environmental stewardship are mandatory for sustainable nature-based solutions. Collective skillsets adapted for learners by appropriate education policies are essential in order to thrive in a technology-rich climate-resilient future.

Introduction

For decades, higher education has operated under a paradigm where its purpose was to create a theoretical foundation for future success. At best, students gained the technical skills for their future careers as part of their higher education studies. It was assumed that when they entered the labour market, university graduates would learn through practice how to be successful employees or entrepreneurs.

There is no doubt that this approach is becoming non-viable as global change is happening rapidly and at an unprecedented level of uncertainty. Artificial intelligence (AI) and other forms of automation are already here and making rapid progress in related research and development. It is assumed that the advancement of technology in the next twenty years holds the potential for major developments that are substantively hard to imagine. Brain-to-brain communication, virtual reality 2.0 and full sensory virtual learning are just a few examples of potential technology-driven advances.

Learning in a Knowledge-rich Technology-demanding World

Although the Fourth Industrial Revolution is expected to create unprecedented developments with new technologies, it also evokes a number of challenges, most notably in terms of the future of skills and work. One study shows that college students do not believe they will be ready for the labour market after graduation (Restuccia, Taska and Bittle 2018). Moreover, employers underline the need for highly adaptable future workers that fit into their jobs from day one of work, which implies an equivalent mandate for the education system to promote learner resilience for dealing with intelligent machines (Probst et al. 2018).

This concern was clearly outlined in an early foresight from Alan Turing, the father of modern computing, who said that “if a machine can think, it might think more intelligently than we do, and then where should we be? Even if we could keep the machines in a subservient position, for instance by turning off the power at strategic moments, we should, as a species, feel greatly humbled” (Turing 1951). Automation is expected to change the nature of almost all jobs in different fields where AI and machines could take over a number of tasks and duties that used to be performed by human workers, whereupon the barriers between professions become blurred (Manyika et al. 2017).

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However, the acquisition of skilled and talented employees remains a big challenge for many organisations. Earlier research by McKinsey & Company shows that 60 per cent of employers claim that they have had unfilled vacancies for more than six months because they cannot find employees with the needed skills (Cota,

Dua, Laboissiere and Lin 2012). The pitfall of the skill gap is expected to become more evident in the future as a new set of occupations and career pathways emerge to serve in different work environments.

The equipping of learners with the demanding skills to excel in the digital age calls for major transformation to the education system. This will involve a broad constellation of stakeholders, including policymakers, technology leaders, educational practitioners and researchers. Additionally, the types of skills needed in the future labour market will change rapidly, so individual workers will have to engage in life-long learning systems to maximize the full potential of their careers (World Economic Forum & The Boston Consulting Group 2018). This fundamental transformation must be driven by innovative higher education that can create a new modality of “learning workers” that combines interdisciplinary expertise and varied skills.

In other words, new kinds of training and capacity development programs are necessary to harness new technology and automation, and also to handle the knowledge boom. Eventually, there will be a need for future employees to be trained to work collaboratively in disciplines outside of their main area of expertise.

Learning for a Sustainable Climate-Resilient Future

Climate change in the context of sustainable development has developed into an ongoing multifaceted climate crisis whose consequences can be identified at different scales. Global multidisciplinary research work is being done to diminish its global impacts. UNESCO defines the biggest challenge of climate change to be “changing minds, not the climate” (UNESCO 2015). In this context, the role of education as a transformative power has often been underestimated, and it is usually driven by the needs of the national government, labour market, and economy. However, education maintains the potential for societal transformation through mutual and joint learning processes, and can be used as an enabler for the responsible climate actions needed in order to restore the balance of Earth’s planetary systems.

Global connectedness and virtual communication channels in the fourth industrial revolution are paving the way for the establishment of new formats of learning within rapidly changing environments. In an era demarcated

by interaction between artificial and human intelligence, it seems prudent to emphasize the value of education and training for an equitable, resilient, and sustainable future reinforcing the value of “leave no one behind”. According to the International Labour Organization report, “embracing sustainable practices and clean technologies in green economies will create millions of jobs while other jobs will disappear as countries scale back their carbon- and resource-intensive industries” (International Labour Organization 2019). Today’s skills will not match tomorrow’s jobs, so innovative educational approaches with newly emerged skillsets are needed to particularly prepare the younger generations to be future-fit, lifelong learners.

Future Skills-Types and Scope

One definition of future skills is “the ability to act successfully on a complex problem in a future unknown context of action” (Ehlers and Kellermann 2019). In general, skills have been classified based on two main dimensions; cognitive and non-cognitive. And findings indicate that both categories are strongly rewarded by labour markets (Grundke, Marcolin, Nguye and Squicciarini 2018). A recent OECD report revealed that “over the last decade, demand for cognitive skills such as written and oral expression, numeracy, reasoning and complex problem solving has increased, while demand for routine and physical abilities decreased significantly. Some skills are particularly valued in digital work environments, such as Science, Technology, Engineering and Mathematics (STEM) as well as self-organisation, management and communication skills” (OECD 2019)

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The World Economic Forum’s report for 2016 identified a set of 16 essential proficiencies for education in the 21st century (Fig. 1), which include six foundational literacies, such as literacy, numeracy and scientific literacy, and ten skills that are labelled either competencies or character qualities. Competencies are defined as

the means by which learners approach complex challenges such as collaboration, communication, critical thinking and problem-solving. Meanwhile, character qualities are demarcated as the ways in which students approach their changing environment, such as curiosity, adaptability and social and cultural awareness (World Economic Forum 2016).

In a more recent Delphi study, future skills have been categorized as 16 skill profiles based on three dimensions. The first dimension is subject and development related skills, which include autonomy, self-initiative, self-management, need/motivation for achievement, personal agility, autonomous learning competence, and self-efficacy. The second dimension refers to object-related

Figure 1: 21st Century Skills (the World Economic Forum 2016)

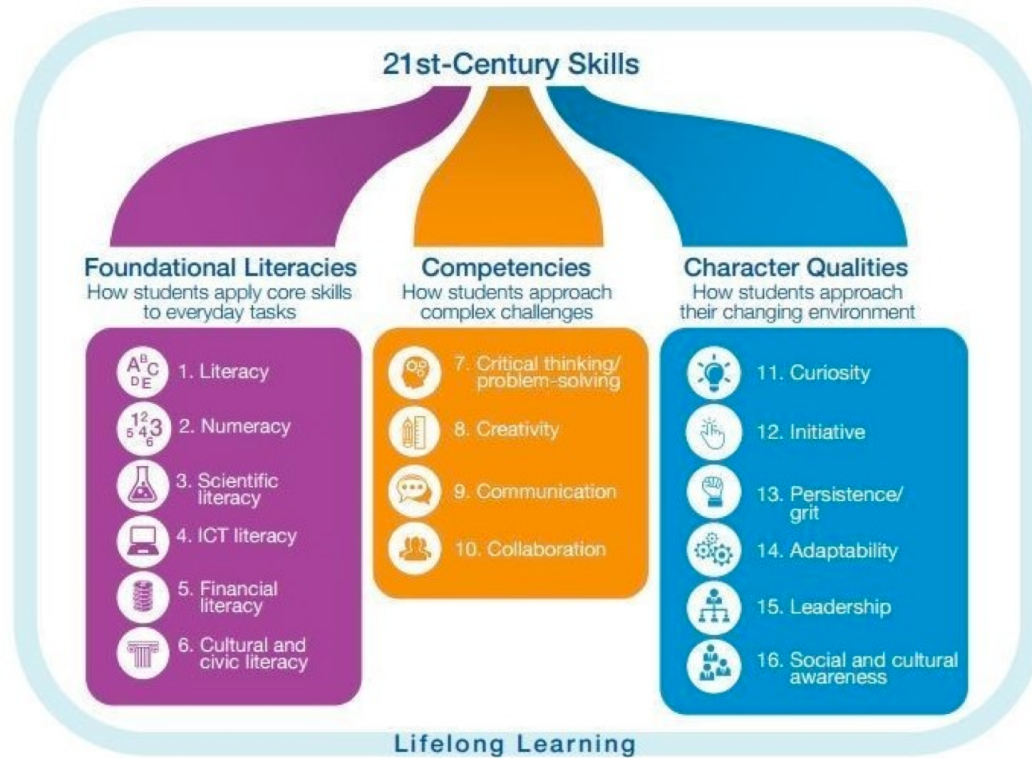
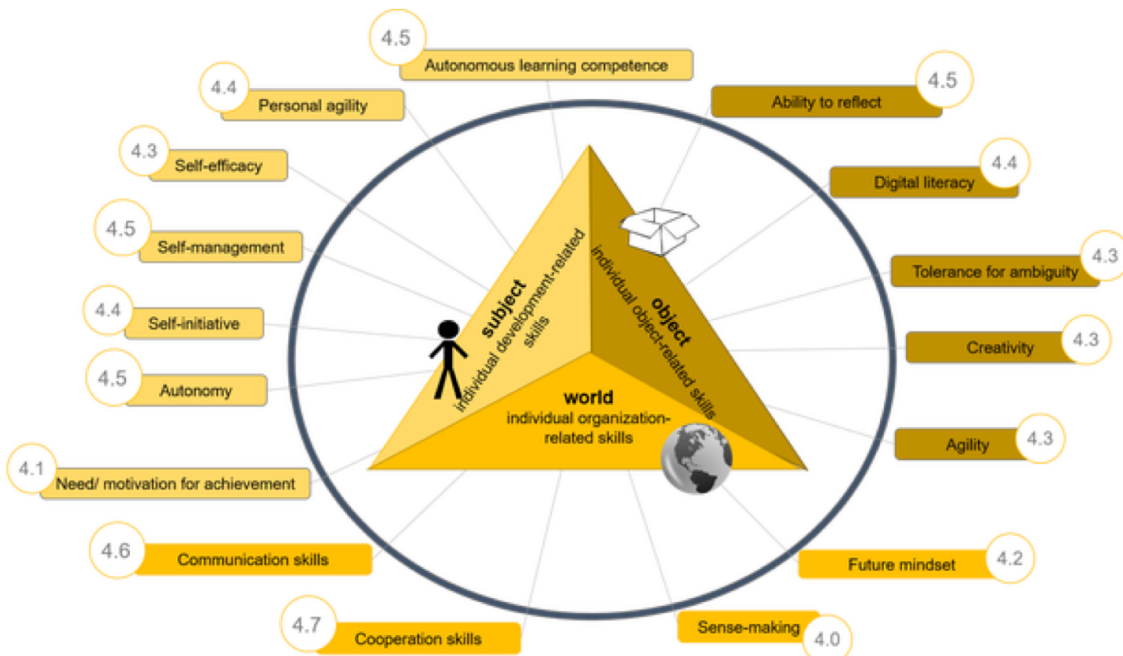


Figure 2: Typology of Future Skills (Ehlers & Kellermann 2019)



skills (instrumental skills), which include agility, creativity, tolerance for ambiguity, digital literacy, and ability to reflect. The third dimension outlines skills related to the social world and organization, which include sense making, future mindset, cooperation skills, and communication competence. Furthermore, each skill profile is an array including further sub-skills (Fig. 2).

Fit-for-future Skillset – the Four Domains

In order to optimize the next generation of learners with fit-for-future skills in a sustainable digital world, we will explore four main domains of skillsets. We assume that the four areas would interface with a digitally enabled workplace while arguing for the need for intellectual convection that values a humanities and nature-oriented approach. This underlines the inevitable linkage between the four skill domains within a holistic system of life-long learning to develop adaptive skills required for the age of rapid technological change.

A. Digital and Technological Skills (the Digi-Tech-set)

Policymakers consider digital and technological skills to be one fundamental of the digital transformation that is expected to create a major scarcity of skilled workers. Research reveals that tens of millions of jobs for workers with advanced digital skills will emerge in the coming years (Decent Jobs for Youth 2017). For example, it is estimated that approximately 500,000 vacancies in Information and Communication Technology (ICT) will be on offer in Europe by 2020. Only in Germany, an estimate of 700,000 workers with technological skills will be needed in 2023, more than those that are available today (Kirchherr, Klier, Lehmann-Brauns & Winde 2019).

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However, digital skills are part of a broader framework and are categorized on a range from basic to more advanced skills. Basic digital skills are foundational skills for performing basic tasks and cover hardware such as using a keyboard and operating touch-screen technology, software such as word processing, managing files on laptops, managing privacy settings on mobile phones,

and basic online operations such as email, searching, or completing an online form. Intermediate digital skills are more significant to assess technology and are profession-oriented, such as desktop publishing, graphic design and digital marketing (Coward 2018). Advanced digital skills, sometimes referred to as technological skills, are a more specialized category that is needed by ICT professionals. Technological skills such as web development, blockchain, smart hardware, big data, cybersecurity, AR, and Internet of Things (IoT) are needed to shape digital transformation.

Another closely related skill in the advanced category is digital entrepreneurship, which combines traditional entrepreneurship skills such as risk-taking, adaptability and critical thinking with a skillset for new and emerging digital technologies such as data analytics, cloud, social media, digital marketing, and web and app development. Occasionally, the latter skills are referred to as SMAC; social, mobile, analytics and cloud.

Good Practice

- DigComp, The European Commission's Digital Competence Framework for Citizens is a tool to improve digital competence, help policymakers formulate policies that support digital competence building, and plan education and training initiatives to improve the digital competence of specific target groups. <https://ec.europa.eu/jrc/en/digcomp>
- #eSkills4Girls was initiated by the G20 members together with UNESCO, UN Women, ITU and OECD to collect and disseminate information and knowledge as well as policy recommendations, good practices and flagship projects on gender digital equality. The platform aims to tackle the existing gender digital divide particularly in low income and developing countries, to increase access by women and girls to the digital world, and to boost relevant education and employment opportunities. <https://www.eskills4girls.org/>

B. Intellectual Skills (the Mindset)

Intellectual skills, sometimes described as “brainpower” or “soft skills”, are still one of the most distinguishing features of remarkable learners and outstanding workers for the striving labour market. According to a 2019 LinkedIn workplace learning report, creativity is the single most in-demand skill for companies to cultivate in their employees (Chelovechkov & Spar 2019). Robots and AI machines might be efficient to opti-

mize old ideas, but organizations most need creative employees capable of solving problems in relevant and original ways. Moreover, effective negotiation, persuasion, analytical reasoning, adaptability, resilience, human analysis, decision making, and logical deduction are increasingly required in a more complex globally-oriented digital world.

Robots and AI machines might be efficient to optimize old ideas, but organizations most need creative employees capable of solving problems in relevant and original ways

In its 2018 future of work report, the World Economic Forum declared a list of prominent intellectual skills that will continue to grow until 2022, and which include analytical thinking, innovation, originality, initiative, critical thinking, negotiation, flexibility, attention to detail, self-regulation, and complex problem-solving. It also underlined a continuously demanding need for capacity development for leadership, service orientation, active learning and learning strategies. Because of the rapidly changing nature of skills in demand, a flexible learning mindset will also be necessary as workers shift from the routines and limits of today's jobs to new unimagined roles (World Economic Forum 2018).

Furthermore, a recent PwC Global CEO survey reveals that today's business leaders recognize the need for these skills as an essential mandate for their workers to run technical processes (PwC 2019). And in an evolving age characterized by uncertainty and unprecedented change, such skills will become increasingly important.²

Good Practice

- Station 1 is a new form of higher education based on inclusion and equity, learning through frontier inquiry and research, and the integration of science and technology with societal perspective and impact. It aspires to be transdisciplinary and draws upon history, social studies of science and technology, equity, social innovation, and leadership development connected to emerging fields of science and technology. <https://www.station1.org/our-model>
- Harappa. Education is an emerging online educational platform in India that is based on a foundational toolkit of five "habits"; think, solve, communicate, collaborate and lead, that are critical to achieve professional success and personal meaning <https://harappa.education/>

C. Socio-emotional Skills (the Heart-set)

In its 2019 published report, the International Labour Organization (ILO) underlines the need to define the human-centred business and economic model by reshaping business incentive structures and supplementary indicators of progress towards well-being, environmental sustainability and equality.

Research revealed that the cause of many unintentional social consequences of new technologies can be attributed to a lack of integration of the non-technical scope of the problem (Ash, Berg and Coiera 2004). Nevertheless, reflection on the ethical aspects and moral questions of technology development and applications requires comprehensive critical thinking and an understanding of morality, history and civilization (Maracke 2019).

And it might take a long time before computers and AI machines learn and understand the distinctions of human communication, particularly in social interactions in cross-cultural contexts. Therefore, workers should capitalize on their "People skills" that seem, so far, unique to human beings. The learning of empathy, compassion, appreciation, inclusion, respect for diversity, active listening, storytelling and social influence are distinguished features of human-human interaction.

Workers should capitalize on their "People skills" that seem, so far, unique to human beings

Another significant trait, not only for effective engagement at work but also to thrive in an ever-changing world, is to embrace emotional intelligence in terms of recognizing and sharing emotions through social and emotional reasoning and sensing.

This could explain the immense surge in demand for healthcare and caregiving careers through 2025. In an increasingly aging population, jobs for home health aides, personal care aides and nursing assistants are expected to grow. Nowadays, assistant physicians and nurses carry out much of the work that doctors used to do; a large part of this implies intimate human interaction between patients and healthcare providers.

Skills development programs should now help learners to integrate human and computing capacity to leverage technological innovations and to deliver social impact at lower costs (Bhatnagar and Kinhal 2019). It will therefore not be possible for employees to perform their duties by merely building up technical expertise in their

relevant fields, for they will also need to harness their emotional and social skills such as communication, collaboration, networking, and cultural understanding. Eventually, the leveraging of current research will be essential to provide more empirical evidence on the socio-emotional skills that are most needed for digitally enabled environments.

Good Practice

- Stanford University's Virtual Human Interaction Lab examines the dynamics and implications of interactions between people in immersive Virtual Reality (iVR) simulations using empirical, behavioral science methodologies. Using iVR interventions to explore racism or empathy allows learners to experience someone else's life. <https://vhil.stanford.edu/projects/>
- Yale center for emotional intelligence focuses on developing innovative and effective approaches to teaching emotional intelligence to students of various ages, staff, parents, teachers, and administrators. <http://ei.yale.edu/what-we-do/teaching-emotional-intelligence/>

D. Environmental Stewardship Skills (the Eco-set)

Sustaining the basis for human life on Earth necessitates fundamental social and economic changes and respect for ecological boundaries. The comprehensiveness and linkages between the UN 2030 Sustainable Development Goals (SDGs) require new forms of knowledge construction, mutual learning, and more intensive collaboration between different actors including traditional educational institutions and academia.

Building on the outcomes of UNFCCC Resilience Frontiers 2019, a "desirable climate-resilient future is portrayed as a world in which the basic needs of a growing world population are met in an environmentally-sustainable way with a growing global change in consciousness towards a nature-first culture" (UNFCCC 2019). Fridays for Future is one example of a global youth movement that urges not only decision makers but all stakeholders including the higher education system to take action and collaborate for a sustainable future. This entails rethinking education to trigger learning of environmental stewardship that embodies responsible planning and management of resources through experiential and ecological learning. Education and training enabled by new and emerging technologies could play a crucial role in re-connecting human beings to nature

and promoting the regeneration of both resilient communities and natural ecosystems.

Spatial skills are also important foundational skills for STEM education. Research demonstrates how everyday activities can create spatial learning opportunities using shapes, blocks, puzzles and origami (Kuhl, Lim Guerriero and Damme 2019). Spatial skills involve mental handling of information about objects in the environment and they can improve both child and adult learning (Uttal, Meadow, Tipton, Hand, Alden, Warren et al. 2013). There is a growing interest in the role of spatial skills in experiential learning; however, it is unlikely that educational research has addressed them to their full potential. By embracing spatial orientation and linking it to nature-oriented approaches, learners can experience a wide set of skills such as curiosity, observation, navigation, reflection and imagination.

Spatial designers often refer to nature as a basis for inspiration. It can teach human beings about systems, materials, processes, structures, efficiency and aesthetics (Kaya, Yücedağ and Aşikkutlu 2018). Therefore, nature-inspired learning and adaptation can be integrated into various technology enabled contexts to embrace ecological solutions and develop a lifelong passion for exploration and learning.

There is a growing interest in the role of spatial skills in experiential learning; however, it is unlikely that educational research has addressed them to their full potential

Good Practice

- The Biomimicry Institute works directly with educators to naturalize biomimicry in the educational system and to ensure that the next generation of change makers has the tools to integrate nature-inspired solutions in their careers. <https://biomimicry.org/>
- The center for learning with nature helps teachers integrate nature-oriented STEM curricula in order to foster a life-long appreciation for nature and accelerate humankind's transition to a more prosperous, equitable, and sustainable future. <https://www.learningwithnature.org/>

Recommendations

We must seize the opportunity to benefit from rapid technological advancement and combine a mixture of

skill-sets to enhance competitiveness. Educational experts and policy makers need to ensure that learners have the skill-sets; notably digital, intellectual, human (people's) and ecological skills that are needed to thrive in technology-rich climate-resilient environments. The recognition of major skill-sets is important not only for education policymakers but also for labour market policy interventions.

Higher education institutions should reflect on and react to emerging labour market demands in their study programmes and actively assist learners to acquire new skills and competences. Universities should continuously monitor the skills necessary to succeed in the future and shift towards providing more life-long learning services that prepare students to be learning workers. Formal and informal tertiary education should better prepare workers for in-demand skills given the increasing rate of digital transformation across different sectors of occupations and industries.

Universities should continuously monitor the skills necessary to succeed in the future and shift towards providing more life-long learning services that prepare students to be learning workers

National training programs supported by government leaders, education experts, employment agencies, and social partners are an essential element to embrace digitalization and help citizens handle the knowledge overflow associated with new technologies. This will help address the increasing mismatch between skills demand and supply and enable social coherence and economic prosperity.

We must focus on the cultivation of human-centred approaches and foster global citizenship. Human skills are essential and are becoming even more important as they distinguish humans from machines and maintain the use of technology for the common good and along the ethical framework.

We must harness the added value of digital technologies to create new learning ecosystems to improve the relevance, accessibility, and quality of education and training, and consider new formats of credentials and micro-degrees for life-long learning towards unbundling education.

We must empower environmental stewardship that features "Nature as the best teacher" in different learning and training interventions to boost the innovation needed to tackle complex challenges and work towards building more sustainable societies and economies.

Corporate sectors need to be reorganized around learning if they are to remain viable and competitive by committing to executive education and on-the-job training to up-skill their workers. This implies the need for visionary leaders with the capability for strategic foresight to lead and coordinate transformative organizational change.

These technological advances and the intersection between humans and automated machines call for more coordinated research that combines interdisciplinary expertise in human psychology, neurosciences, artificial intelligence and machine learning. This will help explain how human brains react to automation and will refine the emergence of skill-building frameworks for educational practice and policy.

Technological advances and the intersection between humans and automated machines call for more coordinated research that combines interdisciplinary expertise in human psychology, neurosciences, artificial intelligence and machine learning

Conclusion

Evident trends are reshaping the digitalization age and they are not far removed from the climate resilience debates. They urge for innovative change to meet the growing demands for new skills associated with rapidly changing technology in the workplace. The fostering of independent self-regulated learning is a key factor to meet these demands and ensure that workers are adapted to work with increasingly more capable machines. This will incorporate activities that promote social and emotional skills and re-connection to nature, thus fostering innovative mindsets that are relatively hard to automate.

Only by identifying the fundamental skills for the future, and mapping the upcoming technological and ecological change, can education be an enabler for positive change. Mutual collaboration among a wide range of actors is needed, including policymakers, education leaders, academic experts, civil society, and technology pioneers.

The establishment of digital, intellectual, socio-emotional, and environmental learning objectives that represent outcomes for life-long learning should eventually be at the heart of the educational system, thus augmenting the value it is meant for.

References

- Ash JS, Berg M, & Coiera E. (2004) Some unintended consequences of information technology in health care: the nature of patient care information system-related errors. *J Am Med Inform Assoc*. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC353015/>
- Bhatnagar P. & Kinhal R. (2019) Transitioning from the era of capacity building to an era of capacity augmentation: how human and computing capacity can partner for social impact. *Digital Skills Insights. International Telecommunication Union (ITU)*. Retrieved from <https://academy.itu.int/sites/default/files/media2/file/Digital%20Skills%20Insights%202019%20ITU%20Academy.pdf>
- Chelovechkov, Ar. & Spar, B. (2019) 3rd Annual 2019 Workplace Learning Report: Why 2019 is the breakout year for that talent developer. LinkedIn. Retrieved from <https://learning.linkedin.com/content/dam/me/business/en-us/amp/learning-solutions/images/workplace-learning-report-2019/pdf/workplace-learning-report-2019.pdf>
- Cota, A., Dua, A., Laboissiere, M. & Lin, J. (June 2012). Rethinking 101: A new agenda for university and higher education system leaders? *Mckinsey & Company*. Retrieved from <https://www.mckinsey.com/industries/social-sector/our-insights/rethinking-101-a-new-agenda-for-university-and-higher-education-system-leaders>
- Coward, C. (2018) Decent Jobs for Youth. Digital Skills Campaign. Retrieved from <https://www.itu.int/en/ITU-D/Digital-Inclusion/Youth-and-Children/Pages/Digital-Skills-Toolkit.aspx>
- Decent Jobs for Youth. Digital Skills, Preparing Young people for the future of work in the digital economy. Digital Skills Campaign. Decent Jobs for Youth. Retrieved from <https://www.decentjobsforyouth.org/wordpress/wp-content/uploads/2017/11/Thematic-Plan-1-Digital-Skills.pdf>
- Ehlers, U.D. & Kellermann, S.A. (2019) *Future Skills: The future of learning and higher education*. Karlsruhe. Retrieved from <https://www.learntechlib.org/p/208249/>
- European Commission. Digital Skills & Jobs. Digital single Market. European Commission. Retrieved from <https://ec.europa.eu/digital-single-market/en/policies/digital-skills>
- Grundke, R., et al. (2018). Which skills for the digital era?: Returns to skills analysis, OECD Science, Technology and Industry Working Papers, No. 2018/09, OECD Publishing, Paris. Retrieved from <https://doi.org/10.1787/9a9479b5-en>
- International Labour Organization (2019). Work for a Brighter Future. International Labour Organization & Global Commission on the future of work. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---dgreports/-cabinet/documents/publication/wcms_662410.pdf
- Kaya L.G., Yücedağ C., Aşıkutlu H.S. (2018) Reflections of Biomimicry to Spatial Design. *Conference proceedings, European Conference on Science, Art & Culture*.
- Kirchherr, J., Klier, J., Lehmann-Brauns, C., & Winde, M. (2019). Future Skills: Which Skills Are Lacking in Germany? Stifterverband für die Deutsche Wissenschaft e.V. McKinsey & Company. Retrieved from <https://www.stifterverband.org/download/file/fid/7116>
- Kuhl, P., Lim S., Guerriero S., & Damme D. (2019) Developing Minds in the Digital Age: Towards a Science of Learning for 21st Century Education, Educational Research and Innovation, OECD Publishing, Paris. Retrieved from <https://doi.org/10.1787/562a8659-en>
- Manyika, J., Lund, S., Chui, M., Bughin, J., Woetzel, J., Batra, P., Ko, R., & Sanghvi, S. (December 2017). Jobs Lost, Jobs Gained: Workforce transitions in a time of automation. New York: McKinsey Global Institute. Retrieved from <https://www.mckinsey.com/-/media/mckinsey/featured%20insights/Future%20of%20Organizations/What%20the%20future%20of%20work%20will%20mean%20for%20jobs%20skills%20and%20wages/MGI-Jobs-Lost-Jobs-Gained-Report-December-6-2017.ashx>
- Maracke, C. (2019) Liberal arts in the context of automation and artificial intelligence. Digital Skills Insights. Retrieved from <https://academy.itu.int/sites/default/files/media2/file/Digital%20Skills%20Insights%202019%20ITU%20Academy.pdf>
- OECD (2019) Going Digital: Shaping Policies, Improving Lives – Summary, OECD, Paris, Retrieved from www.oecd.org/going-digital/going-digital-synthesis-summary.pdf
- Probst, L., Lefebvre, V., Pedersen, B., Frizis, I., Luginer, C., Lange, A., Rodrigues Celho, B.A., Kalogirou, S., & Labib, S. (2018) The Future of Knowledge: A Foresight Report. Mohammed Bin Rashid Al Maktoum Knowledge Foundation (MBRF) & United Nations Development Programme/Regional Bureau Arab States. Retrieved from http://www.knowledge4all.com/admin/uploads/files/The_Future_of_Knowledge_A_Foresight_Report_1.pdf
- PwC. 22nd Annual Global CEO Survey. (2019). PwC. Retrieved from <https://www.pwc.de/de/ceosurvey2019/pwc-22nd-annual-global-ceo-survey-report.pdf>

Restuccia, D., Bledi, T. & Bittle, S. (2018). Different Skills, Different Gaps: measuring and closing the skills gap. U.S Chamber of Commerce Foundation. Retrived from https://www.burning-glass.com/wp-content/uploads/Skills_Gap_Different_Skills_Different_Gaps_FINAL.pdf

The United Nations Framework Convention on Climate Change (UNFCCC). (2019). Resilience Frontiers. Retrieved from <http://www.resiliencefrontiers.org/#about-the-event>

Turing, A.M. (15 May 1951). Can Digital Computers Think?. The Turing Digital Archive. Retrived from <http://www.turingarchive.org/browse.php/B/5>

UNESCO (2015) Addressing Climate Change. United Nations Educational, Scientific and Cultural Organization. Retrieved from <https://en.unesco.org/themes/addressing-climate-change>

Uttal, D. H., Meadow, N. G., Tipton, E. et al. (2013). The malleability of spatial skills: A meta-analysis of training studies. *Psychological Bulletin*, Vol. 139/2, pp. 352-402. Retrieved from <http://dx.doi.org/10.1037/a0028446>.

World Economic Forum & The Boston Consulting Group. (January 2018). Towards a Reskilling Revolution: A Future of Jobs for All. Switzerland: World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_FOW_Reskilling_Revolution.pdf

World Economic Forum (March 2016) New Vision for Education: Fostering Social and Emotional Learning through Technology. Geneva, Switzerland: World Economic Forum & the Boston Consulting Group. Retrieved from http://www3.weforum.org/docs/WEF_New_Vision_for_Education.pdf

World Economic Forum (2018) The Future of Job Report 2018. Switzerland: World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

Case Study — Play4Guide Project

Zacharoula Smyrnaïou

Introduction

Developing entrepreneurship as a key element of educational practices

Entrepreneurship has never been more important than it is now. Entrepreneurs are the driving force of Europe's economy and a cornerstone for sustainable recovery. Europe needs to create an entrepreneurial culture that permeates our schools and universities. Education and training play a crucial role in cultivating an entrepreneurial mindset but need to be adapted and linked more closely to the world of work. Upgrading, adapting and broadening the skills portfolio of individuals to create and fill the jobs of tomorrow is one of the greatest challenges that Europe is facing. Another major challenge is to ensure that people have the right skills. In Europe 2020 vision, education and training systems propose innovative and fair approaches, such as flexible learning pathways, and focus on developing essential skills as well as intellectual and job-specific skills. In order to build skills for the 21st century, efforts are needed to develop entrepreneurial skills that will enhance the employability of young people. In education and training –both for the job and on the job- today's challenge is to find new ways of engaging people in learning processes.

Business Games (BG) may be the answer to this challenge. These are an innovative learning method that reinforces managerial, entrepreneurial, digital and collaborative skills, and promotes critical thinking, problem solving and leadership. Business Games encourage people to learn and refresh their skills, beyond simply using ICT. The Play4Guidance (P4G)⁽¹⁾ project introduces an innovative Business Game designed to train and guide students and young unemployed people in entrepreneurial, transversal and mathematical skills.

Guiding Pedagogical Principles of the P4G Business Game

The pedagogical goals of the P4G project are achieved by taking a multi-disciplinary approach to examine a set of principles that are considered from social-cultural perspectives, psychological principles, gaming experiences and the technological point of view. The P4G online interactive space takes the form of a business game to address both theory development issues and learning purposes.

Having identified the set of principles that inform and support the structure of the P4G Business Game it is important to consider and clarify the specific learning objectives that it addresses and describe their assessment process in order to provide a roadmap for designers to develop the game model. This attempt addresses both theoretical and practical issues that need to be considered in order to accomplish a complete and efficient template with specific learning objectives and assessment points for P4G Business Game users.

The learning objectives are the result of different data entries and research examinations. Specifically, they were based on the results of the Assessment Output (Skill Matrix), the characteristics of the P4G business game and the pedagogical theory related to online gaming as mentioned in the first section. The identified learning objectives address two fundamental aspects of game engagement: (1) users' skill development, i.e. players' behaviour/development as problem solvers and (2) users' cognitive development, i.e. their knowledge/learning about business and management sciences.

The first aspect of game engagement occurs as a natural element based on the expectations set and the 'modus operandi' of the game and is therefore embedded in the pedagogical structure of the game. Throughout the game, players are prompted and challenged to use available information and data in order to meet the game's expectations. In doing so they are engaged in cognitive processes that necessitate the development and application of various and multifaceted skills. Players are instructed and guided to fulfill

1. <http://play4guidance.eu/about/>
(Play4Guidance is funded by the Erasmus+ EU Programme.
Project Duration: 1 September 2014 – 31 August 2017)

a set of tasks that consist of strategies that need to be designed and developed: a) make decisions based on the evidence available to them, b) seek out further evidence, c) organize and examine evidence, d) conduct safe-to-fail tests (when insufficient evidence is available to them) and e) decide upon and follow a strategy. When engaged in such tasks, users have to practice and apply a set of skills in order to make informed, data-based decisions. For example, while examining evidence they need to sort out relevant and irrelevant factors, issues and facts; prioritize evidence for their given goal and develop a strategy for monitoring evidence in the light of dynamic changes in the game environment. In group situations they should also discuss all the evidence and factors, listen to each other, and develop a clear strategy that they all agree to follow. This means that users of the P4G business game are engaged in hands-on activities in a realistic setting that simulates real business conditions and market needs that challenge such essential entrepreneurship skills as problem solving (defining the problem, generating alternatives, evaluating and selecting alternatives, implementing solutions, etc.), analytical thinking (the abstract separation of a whole into its constituent parts in order to study those parts and the ways they relate to each other), creative thinking, and many others.

The second aspect of game engagement addresses the users' cognitive development, i.e. their comprehension of the business practices of the game environment. This involves a set of learning objectives that specifically focus on the users' practice and acquisition of essential knowledge in terms of business terminology as well as business practices and sustainability issues. Regarding cognitive development, the following learning objectives have been identified:

- Essential Business Understanding: players should have a clear understanding of their game/business goals.
- Supply Management, Production, Basic Marketing Skills: players should understand the areas where resources need to be invested (R&D, marketing, human resources, capital equipment, raw materials, logistics, etc.)
- Critical Thinking: players should understand what areas need to be prioritized at different stages of a business cycle.
- Organization and Planning: players should act with full knowledge of financial constraint and probity: i.e. understand cash flow, P & L, trading while insolvent, debt finance etc.

- Communication and Cooperation, Leadership, Managerial Skills, Teamwork Skills (in case of 'team' player scenario): players should take turns, listen to each other, and record decisions.

Play4Guidance European Project in the framework of developing entrepreneurship in collaboration with educators

The priorities of education policies include the development of skills to enable young people to progress in a society and in workplaces that are becoming more complex and uncertain due to technological evolution. It is essential to design the context and methods of skills assessment. As part of the Play4Guide Project (P4G)⁽²⁾, an innovative business game designed to educate and guide students in business, transversal and mathematical skills is introduced. The National Kapodistrian University of Athens (NKUA)⁽³⁾ designed a self-assessment instrument⁽⁴⁾ based on the pedagogical approach used by the P4G project.

A key element of the P4G self-evaluation instrument is the way its structure accommodates several functionalities and tools for both formative and summative assessment. The former is facilitated by the way the game records users' decisions and actions in terms of the values of the parameters implemented in the game; so players can make a comparative analysis of their decisions and results and keep track of their rate of progress. Summative assessment is implemented in the game in the form of an assessment report that appears at the end of the game sessions. This report informs users about their performance for all key business skills, providing them with explicit feedback on their strengths and the areas that need improvement.

The aim is to provide a short series of guidelines for trainers and stakeholders on how the tool can be used by students/participants for self-assessment, and for external evaluation by such institutions as guidance centers, employment centers, SMEs, companies and universities as a tool for assessing participants' skills and guiding them through training and skill-building.

*For further information, see the 'Tool of self-evaluation and evaluation for guidance' document in the Educational Resources section of the P4G Platform - <http://play4guidance.eu/p4g-resources>

2. <http://www.play4guidance.eu/>

3. <http://play4guidance.eu/the-partners/national-and-kapodistrian-university-of-athens-nkua-greece/>

4. http://play4guidance.eu/wp/wp-content/uploads/2016/01/P4G_Pedagogical_Framework.pdf

Case Study — The Communicative Competence of University Students: a Case Study

Marta Gràcia

The role of teachers has changed because of the construction of the European Higher Education Area (EHEA), social changes, the generalization of the use of technologies and their incorporation into educational contexts. This implies the need to review the way of approaching the training of university teaching staff, in order to adapt to the new paradigm that promotes new competences in future professionals and, among them, communicative ones (Gaebel & Zhang 2018). In recent years, the competence approach has been gaining ground in all areas and levels of formal education, even though the discussion regarding what communicative competence supposes is still open (Bagarić & Mihaljević Djigunović 2007). Acosta (2012) raise the need to encourage the participation of university students in classes as an element of critical thinking construction. All these considerations are linked to the objectives proposed by an interuniversity team of researchers in the framework of various interdisciplinary projects whose main objective is to contribute to improving the communicative and linguistic competence of university students in the framework of the digital revolution, which involves integration of technologies.

EVALOE as an instrument for reflection and improvement of the communicative competence of university students

Gràcia, Galván-Bovaira, Sánchez-Cano, Vega, Vilaseca, & Rivero (2015) developed a tool for assessing oral language teaching and learning in the classroom (EVALOE) based on a sociopragmatic and ecofunctional perspective of language acquisition. EVALOE is based on the principles of the Conversational Methodology, which conceptualises classrooms as communicative spaces in which oral language is reflected upon and taught, constituting a key tool

in the learning of contents in all areas of the curriculum (Gràcia, Casanovas et al. 2018; Gràcia, Galván-Bovaira & Sánchez-Cano 2017; Gràcia, Vega & Galván-Bovaira 2015). The aim is to offer teachers and other professionals a tool that enables them not only to evaluate the teachers' skills and strategies for fostering communicative competence in the classroom, but also to assess the interactions between the teacher and learner and their linguistic actions.

EVALOE is an observation scale based on 30 items grouped into three dimensions (Context and Management of Communication, Instructional Design, and Strategies and Communicative Functions) with three response options (1, 2, 3).

EVALOE-U it is a revision of the first version of the instrument adapted to the university context (Gràcia, Adam et al. 2018). The results of the case in which it has been worked highlight evident changes in the way teachers use oral language in the university context. The reflection on the Conversational Methodology indicates that the teachers introduce conversational management strategies, try to make their students aware of the inclusion of contents related to the oral language in the classes and their evaluation, and use some communicative strategies in their classes. These findings suggest that the tool has contributed to increase its utility not only to analyze the interactions that they take place in a university context, but also to improve it, since it has been one of the elements that have helped teachers to incorporate changes in their classes.

EVALOE-SSD as a digital tool for reflection, self-evaluation and decision making and its use in a university context

The EVALOE-SSD (Gràcia et al. 2018) is a digital application (EVALOE-DSS) for the professional development

of teachers aiming to develop their students' linguistic competence. This tool has been built within the context of a collaboration between researchers in the area of computer technology, and researchers in the area of educational psychology in its more scientific, but also technological, since it is a tool that it allows us to evaluate situations in which cognitive, linguistic and educational processes take place. This collaboration takes place in the framework of a shared interest and clear synergies in the need to enhance the humanities: we share the need to help university students to advance in matters related to the academic domain of the language spoken in their own culture, as well as other languages present in the educational and professional context.

The results of the validation of this digital application indicate that EVALOE-DSS, aims to help teachers improve their teaching practices when they are developing language competence in their students. The digital application includes items related to conversation management, the arrangement of furniture, students and materials, as well as to actions carried out by students regarding their participation in conversations, among others. Thus, the instrument represents a resource for teachers to reflect on their concepts of teaching and learning, considering the students as learners who can learn almost as much from their peers as from their teacher by engaging in dialogues and discussions and listening to a variety of perspectives (Nami, Marandi & Sotoudehnama 2016).

The case presented is an example that highlights that interdisciplinary work is possible from the technological, scientific and humanistic areas, and that in this context a joint research project has been developed that demonstrates that it is possible to improve the communicative competence of university students in a specific area of knowledge, which could be extrapolated to other areas in the university context, adjusting the instruments appropriately. To ensure that teachers of different grades and disciplines self-evaluate their practice in relation to oral language teaching, and that this contributes to university students incorporate communicative and linguistic skills that are useful for their future professional practice and as citizens of a society in which this competition is increasingly valued, seems to be possible.

References

- Acosta, F. M. (2012). Educar, enseñar, escolarizar: el problema de la especificación en el devenir de la Pedagogía (y la transmisión). *Tendencias Pedagógicas*, 20, pp. 93-105.
- Bagarić V. & Mihaljević Djigunović J. (2007). Defining Communicative Competence, *Metodika*, 8, pp. 94-103.
- Gaebel, M. & Zhang, T. (2018). Trends 2018. Learning and teaching in the European Higher Education Area. Belgium: European University Association.
- Gràcia, M., Adam, A. L., Carbó, M., Rouaz, K. & M. Astals. (2018). La competencia comunicativa y oral en la formación inicial de maestro. *Pensamiento Educativo. Revista de Investigación Educativa Latinoamericana*, 55(2), pp. 1-16.
- Gràcia, M., Casanovas, J., Sancho, M-R., Casanovas, J. & M. Cuatrecasas. (2018). Empowering Teachers' Self Assessment of Their Own Practice on Student's Oral Skills - EVALOE Decision Support System. In *Proceedings of the 10th International Conference on Computer Supported Education*, 2, pp. 272-277.
- Gràcia, M., Galván-Bovaira, M.J. & M., Sánchez-Cano. (2017). Análisis de las líneas de investigación y actuación en la enseñanza y el aprendizaje del lenguaje oral en contexto escolar. *Revista Española de Lingüística Aplicada*, 30(1), pp. 188-209.
- Gràcia, M. (coord.), Galván-Bovaira, M. J., Sánchez-Cano, M., Vega, F., Vilaseca, R. & M. Rivero. (2015). *Valoración de la enseñanza de la lengua oral: Escala EVALOE*, Barcelona: Graó.
- Gràcia, M., Vega, F. & M.J. Galván-Bovaira. (2015). Developing and testing EVALOE: a tool for assessing spoken language teaching and learning in the classroom, *Child Language Teaching and Therapy*, 31(3), pp. 287-304.
- Kuhn, D., Hemberger, L. & Khait, V. (2016). Dialogic argumentation as a bridge to argumentative thinking and writing / La argumentación dialógica como puente para el pensamiento y la escritura argumentativa, *Infancia y aprendizaje*, 39(1), pp. 25-48.
- Nami, F., Marandi, S. S. & E. Sotoudehnama. (2016). CALL teacher professional growth through lesson study practice: An investigation into EFL teachers' perceptions, *Computer Assisted Language Learning*, 29(4), pp. 658-682.

Part 5

Research

13. What do we understand socially responsible multidisciplinary research to mean today and what changes need to be made to current research protocols and methods?

Fostering Institutional Changes towards Responsible Research and Innovation through European Framework Programmes for Research and Innovation

Linden Farrer and Philippe Galiay

Abstract

Research, Technology Development and Innovation (RTDI) have been on the agenda of the European Commission since its inception. The Commission considered them important for many purposes: supporting coal, steel and energy policies, providing scientific advice, and, since 1984, funding research and innovation (R&I) projects through the series of Framework Programmes for Research and Technology Development (FPs). Return on investment has always been a key consideration for European society, and the constant upward evolution of the amounts dedicated to RTDI shows that Member States and the European Parliament perceive this as a beneficial investment for Europe. Today more than ever, as the perfect storm approaches, combining economic, social and environmental dimensions, there is increased pressure for the FPs to focus on more impactful RTDI and to progress towards the United Nations' Sustainable Development Goals (SDGs). Under Horizon 2020 (H2020, the 8th FP for R&I), the concept of Responsible Research and Innovation (RRI) has been applied as a cross-cutting issue. It calls on RTDI stakeholders to work together in transdisciplinary consortia to better align R&I outcomes with European citizens' values, expectations and concerns. Over time, the emphasis of science and society policies has shifted from a largely societal deficit approach to one that increasingly recognises deficits and capabilities across society, requiring urgent changes in education systems, behaviours and governance frameworks. Institutional Change (IC) towards RRI, i.e. targeted evolutions of RTDI stakeholders' organisations, has become a strategic orientation of the Science with and for Society programme under H2020 in order to accelerate and sustainably embed these evolutions towards RRI. As the end of H2020 nears, and as the blueprint of its successor, Horizon Europe, is being polished, it is useful to reflect on where we are in terms of

mainstreaming RRI in both of these FPs. Is the support given under H2020 to ICs towards RRI bearing fruit? What lessons can be drawn from close to two decades of support for science-society activities? What needs to change in European education, research and innovation system(s)? What can be changed? And what is changing? This article takes stock of the present situation and suggests actions to optimise use of RTDI potential for reaching the SDGs by 2030.

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Introduction

Research has been on the European Commission's (EC) agenda since its inception. It has served many purposes, from supporting coal, steel and energy policies, to providing scientific advice for its policy making, and has been funded through Framework Programmes (FPs) for Research and Technology Development since 1984. There has been a steady evolution in the shape and size of the European funds dedicated to research, demonstrating that it is perceived to be beneficial and has added value for Europe.

Given the public sources of the funding, the relatively high profile of European research programmes, and their increasing scope and size, return on investment has

become a key policy preoccupation for European citizens. This is apparent in policy orientations that emphasise the importance of societal impact, buy-in and involvement, such as Commissioner Moedas' 3Os strategy (Open Science, Open Innovation, Open to the World⁽¹⁾).

In 2014, Responsible Research and Innovation (RRI) was introduced as a cross-cutting issue in H2020 (FP8), aiming to bring societal actors from across disciplines into the R&I process to improve its outcomes and contribute to solving the major issues of our times as expressed in the Sustainable Development Goals (SDGs). Many years before this, in 2001, a 'science and society' action plan was launched, accompanied by subsequent dedicated funding for science-society issues in Science and Society (FP6), Science in Society (SiS, FP7) and Science with and for Society (SwafS, FP8)⁽²⁾.

As we near the end of H2020 and as its successor, Horizon Europe, is being polished, it is useful to take stock of what has been learnt in the last two decades and convey that learning to whoever can make a change to education, research and innovation system(s).

The European Commission's evolving narrative for research and innovation

To begin, and without entering into too many details⁽³⁾, it is useful to examine the evolution of the rationale behind RTDI decisions at the European level. Each of the following steps were the crystallisation of periods of reflection, thought and discussion, rather than sudden turning points, responding to well defined European purposes.

Research was already present in the 1951 treaty that established the European Coal and Steel Community. It was also part of the treaty establishing the European Atomic Energy Community (Euratom), signed in 1957, in support of research on nuclear energy. The Joint Research Centre (JRC) was created in 1961, with the goal of establishing a uniform nuclear terminology and a standard system

1. <https://ec.europa.eu/digital-single-market/en/news/open-innovation-open-science-open-world-vision-europe>.

2. Examples of funding with 'science-society' objectives can also be found in non-dedicated parts of the FPs.

3. Further details can be found, for instance, at: <https://horizon-magazine.eu/article/europe-s-framework-programmes-key-element-research-policy-europe.html> and [http://www.europarl.europa.eu/RegData/etudes/IDAN/2017/608697/EPRS_IDA\(2017\)608697_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/IDAN/2017/608697/EPRS_IDA(2017)608697_EN.pdf).

of measurements. Later, from the 1980s onwards, the mission of the JRC became the provision of independent science and technology advice to the EC⁽⁴⁾.

The Framework Programmes for Research and Technology Development

The first four FPs aimed to build a European community of researchers around pre-competitive research in a relatively small number of technological areas. However, the 5th FP (1998-2002) expanded the scope by putting the FP at the service of citizens; as the official Communication put it: "The aim now is to make research more efficient and increasingly directed towards meeting basic social and economic needs by bringing about the changes which each individual citizen desires". Subsequent FPs continued in this direction, increasingly broadening beyond technical issues and focusing on society, social impact and lately (from FP6 onwards) citizen engagement. The interim evaluation of Horizon 2020 attested to the very high level of European added value of such dedicated support for science and society issues.

The shift towards the FPs happened in the early 1980s when Étienne Davignon, then European Commissioner for Industrial Affairs and Energy, rationalised research funding activities that had spread across the EC under a single FP for Research and Technology Development (FP). The first FP was launched in 1984, 35 years ago, and its success has been uninterrupted since then through a series of avatars.

The adoption of the Single European Act in 1986 definitively introduced RTD to the treaties. Article 13 stated: 'The Community's aim shall be to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at international level'⁽⁵⁾. In 1992, the Maastricht Treaty added 'while promoting all the research activities deemed necessary by virtue of other chapters of this Treaty' to the 1986 paragraph, introducing an important policy dimension and expanding the scope of RTD activities⁽⁶⁾.

4. https://ec.europa.eu/jrc/sites/jrcsh/files/jrc_ispra_50_years_history_en.pdf.

5. <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:11986U024&from=FI>.

6. <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:12002E163:EN:HTML>.

By signing the Treaty of Lisbon in 2007, the Member States further completed the Maastricht Treaty, going beyond EC competences with the notion of the European Research Area (ERA) by engaging other levels of governance and stakeholders.

Another important innovation, though not directly related to RTDI but potentially important for it, was also introduced by the Treaty of Lisbon – namely, the ‘Citizens’ initiative’, which aimed to close a perceived gap between citizens and decision making in the European Union (EU).

RTDI investments at European level have increased over time and moved from a predominantly technical bend to one increasingly focused on citizens. As we shall see, from 2000 onwards, the EC has promoted a series of initiatives to ensure that its R&I funding and policy, while improving the EU’s science and technological base, bridges the gap between the EU and its citizens and responds to citizens’ needs, concerns and expectations.

Exploring science and society interplay from 2000 to 2020

At the turn of the century, the European Commissioner for Research, Philippe Busquin, fundamentally changed the course of RTDI policy by re-launching the concept of the ERA, as previously evoked by eminent predecessors such as Altiero Spinelli⁽⁷⁾ in 1972 and supported by the European Parliament as early as 1982⁽⁸⁾. Two communications adopted by the EC in 2000⁽⁹⁾ have formed the cornerstones of the ERA ever since, and in the latter, a full chapter was dedicated to the ‘science, society and citizens’ triptych:

“[A] series of activities would be carried out... to tailor research activities and policies more closely to the needs of society, and take into account the social consequences of scientific and technological progress”.

7. Objectives and instruments of a common policy for scientific research and technological development, CEC, COM(72) 700, 14 June 1972.

8. JO n° C 334 du 20. 12. 1982, p. 96 — Rapport Linkohr (doc. 1-654/82).

9. See ‘Towards a European Research Area’, COM(2000)6, 18.01.2000, and ‘Making a reality of the European Research Area: Guidelines for EU research activities (2002-2006)’, COM(2000)612, 4 October 2000

The Communication proposed support, inter alia, for science-society dialogue:

“Initiatives to bring into contact researchers, industry, policymakers and citizens (“Citizens’ Conferences” on a European scale, etc.). Initiatives to promote the public’s knowledge of science and technology: support for collaboration between museums and centres for scientific culture, schools, television stations, magazines and publishers; European Science Week”.

The 2001 Science and Society Action Plan

1. Promoting scientific education and culture in Europe
 - 1.1 Public awareness
 - 1.2 Science education and careers
 - 1.3 Dialogue with citizens
2. A closer science policy to the citizens
 - 2.1 Involving civil society
 - 2.2 Producing gender equality in science
 - 2.3 Research and foresight for society
3. Responsible science at the heart of policy-making
 - 3.1 The ethical dimension in science and the new technologies
 - 3.2 Risk governance
 - 3.3 The use of expertise

10. SEC(2000) 1973, Brussels, 14.11.2000. See https://ec.europa.eu/research/swafs/pdf/pub_public_engagement/ss_en.pdf.

11. COM(2001)714, 4 December 2001. See https://ec.europa.eu/research/swafs/pdf/pub_gender_equality/ss_ap_en.pdf.

2001: An action plan for science and society

In 2001, the Commission released a document called ‘Science, society and the citizen in Europe’⁽¹⁰⁾, and at the request of the Council the Commission adopted the ‘Science and Society Action Plan’⁽¹¹⁾. This largely influenced the EC’s RTDI activities in relation to society under FP6 and FP7.

From science literacy to ‘science and society literacy’

The first pillar of the action plan was to promote scientific education and culture. Significant resources were put towards this in the SiS programme (EUR 80 million, 30% of the total), a large part of which was through 22 projects on Inquiry-Based Science Education (IBSE). Although the ex-post evaluation of the SiS programme found individual successes, there was ‘little evidence to show that the science education projects have, as yet, led to any significant and widespread changes at a systemic level within Europe’, mostly due to project-based approaches and difficulties involving policy makers in them⁽¹²⁾, but also because the approach was too narrow.

Correspondingly, and as FP7 neared its end, attention broadened from children to life-long learning in formal, informal and non-formal settings, from STEM (science, technology, engineering and mathematics) to STEAM (science, technology, engineering, arts and mathematics), and from science education in general and IBSE in particular to questions of responsible science and citizenship⁽¹³⁾ and governance of science itself.

The important lesson - that broad, systemic and transdisciplinary approaches were needed to achieve science-society policy goals - helped contribute to a shift in the diagnosis of the science-society problematic. It evolved from societal deficit (‘lack of scientific literacy’) to one identifying deficiencies in scientific governance and the inability or unwillingness of S&T and R&I to adequately leverage societal capacities and capabilities towards its objectives. The latter problematic, to be tackled by improving ‘science and society

literacy’, provided the palimpsest for future work on institutional changes (ICs) and Open Science in H2020.

The important lesson - that broad, systemic and transdisciplinary approaches were needed to achieve science-society policy goals - helped contribute to a shift in the diagnosis of the science-society problematic

The 2014 Rome Declaration: talking RRI

On 21 November 2014, a conference gathering more than a thousand RTDI stakeholders was held in Rome: ‘Science, Innovation and Society: Achieving Responsible Research and Innovation’. It took stock of activities relating to science and society supported by FP6 and FP7. At the end, the Rome Declaration was adopted⁽¹⁴⁾, in which a renewed diagnosis of the complex interplay between science and society was proposed:

‘More than a decade of research and pilot activities on the interplay between science and society points to three main findings. First, we cannot achieve technology acceptance by way of good marketing. Second, diversity in research and innovation as well as the gender perspective is vital for enhancing creativity and improving scientific quality. Third, early and continuous engagement of all stakeholders is essential for sustainable, desirable and acceptable innovation. Hence, excellence today is about more than ground-breaking discoveries – it includes openness, responsibility and the co-production of knowledge’.

RRI, understood as the ‘on-going process of aligning research and innovation to the values, needs and expectations of society’, was put forward as the operational means to advance synergy between science and society. The benefits of adopting RRI were considered manifold: delivering better R&I solutions to pressing societal challenges, engaging new perspectives and sources of knowledge and talent, identifying solutions that would otherwise go unnoticed, and raising societal trust in R&I.

By focussing on practical steps to fundamentally transform R&I, the Rome Declaration was completing another

12. <https://publications.europa.eu/s/lo1b>.

13. http://ec.europa.eu/research/swafs/pdf/pub_science_education/KI-NA-26-893-EN-N.pdf.

14. https://ec.europa.eu/research/swafs/pdf/rome_declaration_RRI_final_21_November.pdf.

trilogy comprising the 2009 Lund Declaration⁽¹⁵⁾ on the orientation towards grand challenges, and the 2013 Vilnius Declaration⁽¹⁶⁾ on the need to better integrate the social sciences and humanities (SSH) in multidisciplinary activities. This is reflected in the fact that SSH and RRI are separate cross-cutting issues in H2020; though interacting with each other to some extent, they have essentially different policy goals: one to promote certain disciplines (SSH) and multidisciplinary more generally, and the other to promote the joint involvement of all of society, including citizens, in R&I regardless of discipline.

RRI, understood as the ‘on-going process of aligning research and innovation to the values, needs and expectations of society’, was put forward as the operational means to advance synergy between science and society

The participants and organisers adopting the Rome Declaration, among which were many from higher education organisations, issued a call to ‘make RRI a central objective’ across R&I activities and stakeholders were

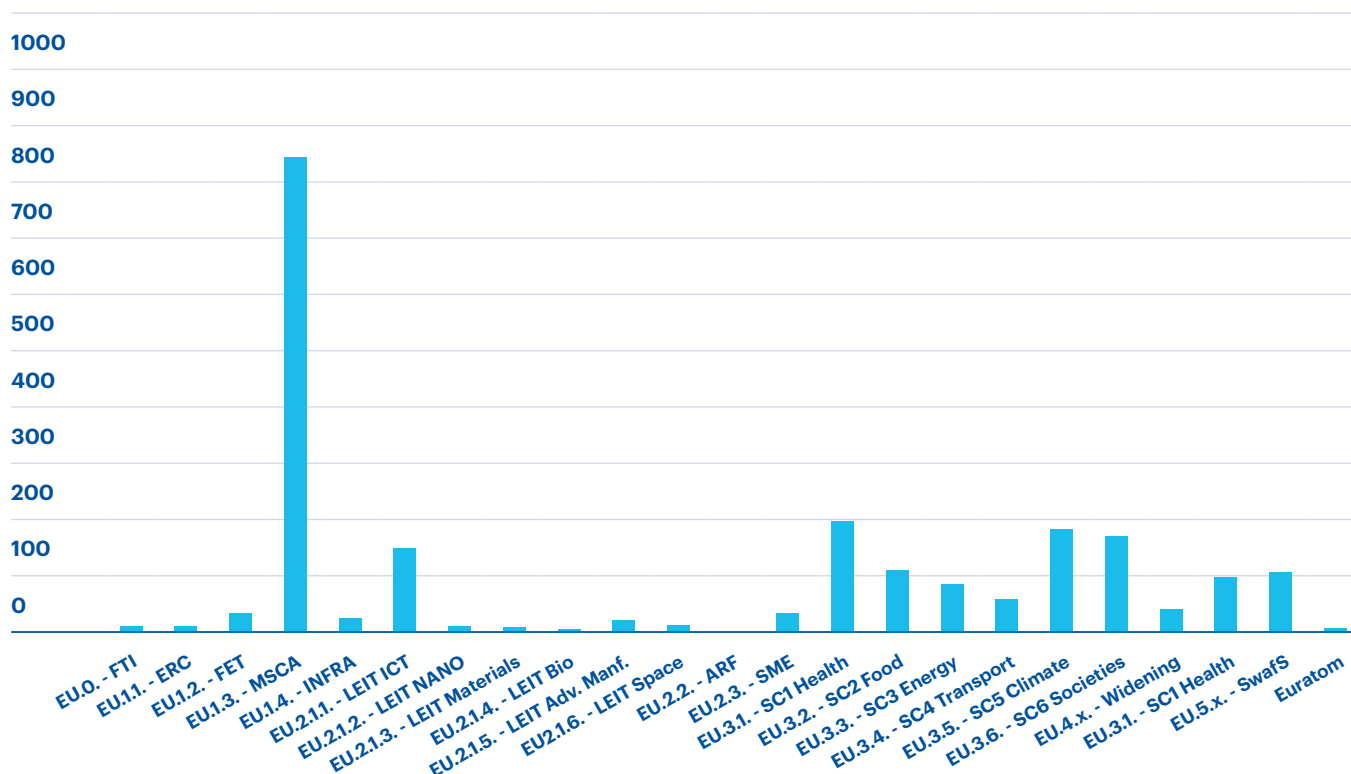
invited to build capacity for RRI, develop and implement RRI metrics, and implement ICs to foster RRI.

RRI in Horizon 2020 and the European Research Area

How was RRI translated into Horizon 2020

The EU took the lead in responding to the Rome Declaration by establishing RRI as a cross-cutting issue in H2020 with a sector in its organigram to ‘mainstream’ RRI across its services, strategies, policies and projects. An operational approach to RRI was taken, focused on five dimensions (gender equality, science education, open access/open data, public engagement, ethics) and underpinned by attention to governance, ensuring that RRI applied to all disciplines and sectors. RRI was mentioned (albeit rather inconsistently) across all three of H2020’s Work Programmes (2014-2015, 2016-2017, and 2018-2020) and from 2017 it has been possible for applicants to search for RRI-relevant topics across programme parts.

Figure 1: Number of H2020 actions identified as taking an RRI approach



Source: EC internal analysis (May 2019)

15. <http://www.vr.se/download/18.7dac901212646d84fd38000336/>.

16. https://erc.europa.eu/sites/default/files/content/pages/pdf/Vilnius_SSH_declaration_2013.pdf.

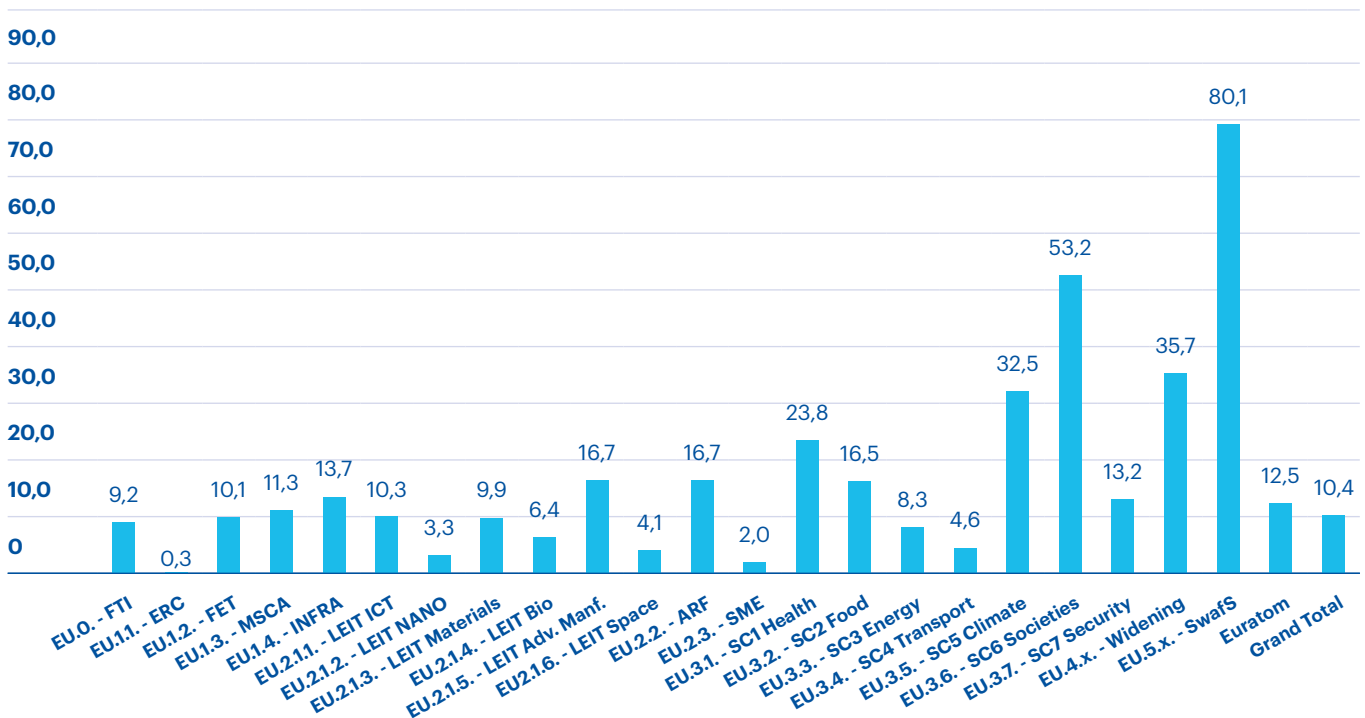
Project officers spread across the EC and its executive agencies were instructed to ‘flag’ projects as being examples of RRI when citizens were invited to participate in R&I activities in one way or another; the EU’s internal guidance took public engagement as the proxy for RRI. In fact, the RRI ‘flag’ encompasses a whole range of RRI-type of activities and modes of action – from explicit RRI co-creation to multi-stakeholder/multi-disciplinary projects that do not involve citizens at all except in their dissemination activities.

Nevertheless, the RRI KPI is useful for measuring the proximity of the different WP parts to citizens and society. As can be seen, SwafS and SC6 pay the greatest attention to RRI approaches but the largest numbers of projects are actually found in MSCA. Overall, 2287 projects took an RRI approach as of May 2019, representing approximately 10% of the total and a maximum EU contribution of EUR 7.7 billion. The KPI will live on in Horizon Europe as the short-term KPI in the societal impact pathway (see below).

Giving a map and a compass to RRI in the European Research Area

The EC launched a tender in 2013 to develop a European monitoring system for RRI called ‘Monitoring the Evolution and Benefits of Responsible Research and Innovation’. The final report described 36 indicators that enabled measurement of RRI, the evolution of RRI at country level, laid the groundwork for the measurement of the benefits (longer-term impacts) of RRI, and demonstrated the key role of R&I institutions in implementing RRI-supportive governance structures and the transformative potential of the FPs on researchers involved in FP projects⁽¹⁷⁾. Rather than ‘simply’ ranking EU member states, the study showed empirical similarities and dissimilarities between clusters of ERA countries – reflecting diverse cultural and historical starting points and confirming the added value of EU support to promote learning between countries.

Figure 2: Proportion of H2020 actions identified as taking an RRI approach



Source: EC internal analysis (May 2019)

17. <https://publications.europa.eu/s/kWqy>.

A follow-up project, Super_MoRRI⁽¹⁸⁾, is improving the monitoring system, developing metrics for the benefits of RRI, enabling international comparisons, and eventually launching a user-friendly dashboard to help RTDI stakeholders interact with the results⁽¹⁹⁾. This should be of particular use to ERA stakeholders, including higher education organisations and other organisations active in informal and non-formal education to science.

Institutional changes in R&I organisations as a key modality towards RRI

Lessons from FP6 and FP7, the interim evaluation of SwafS, and projects such as MoRRI led to increased attention being placed on ICs as a means of working towards RRI. Promoting RRI was not enough: framework conditions had to change to support the much needed cultural and behavioural transformations. This

is why the sole KPI for SwafS under H2020 measured ICs towards RRI⁽²⁰⁾. Several topics provided support for ICs under the first two SwafS Work Programmes (WPs) and the first wave of projects is only just coming to a close. Once a sufficient body of evidence is available it will be important to assess the impacts and lessons learnt from these projects.

The third and final SwafS WP (2018-2020) made ICs one of its five strategic orientations with an allocated budget of EUR 16m, not including several other IC topics focused on ethics, gender, researcher careers, and territorial development⁽²¹⁾. The topics were more explicit in demanding sustainable institutional changes, and work towards SMART⁽²²⁾ impacts – thereby responding to the interim evaluation of SwafS⁽²³⁾ that called for a sustainable and operational approach to ICs, as opposed to a more fluid one centred on debate and reflection⁽²⁴⁾.

Table 1. Types of institutional change

Types of institutional change	Example change
Gender	Implementation of a Gender Equality Plan ⁽²⁵⁾ .
Science education	Introduction of a new curriculum (e.g. on RRI), new teaching methods, and new means of systematically fostering informal scientific learning in non-educational settings (e.g. citizen science activities).
Open access/open data	Introduction of new rules or practices concerning open access to publications and research data.
Public engagement	Implementation of new means of systematically engaging citizens/Civil Society Organisations in R&I activities such as through agenda setting, foresight and public outreach; earmarking of budgets for public engagement activities; introducing new rewards and incentives into career development processes that favour public engagement.
Ethics	Implementation of new rules concerning treatment of research ethics, codes of conduct, ethical reviews.
RRI 'package'	A comprehensive package of measures across the five RRI dimensions listed above.

Source: Internal document

18. <https://www.super-morri.eu>.

19. <https://cordis.europa.eu/project/rcn/219479/factsheet/en>.

20. A target of 100 Institutional Changes has been set for the whole duration of Horizon 2020, i.e. until the end of the last project funded (most probably 2024).

Key Impact Indicators of the societal impact pathway for Horizon Europe

6 Message: Horizon Europe creates value for European citizen, as shown by the engagement of citizen in the projects and beyond the projects by improved uptake of scientific results and innovate solutions⁷.

Co-creation — Number and share of FP prejects where EU citizens and end-users contribute to the co-creation of R&I content

Engagement — Number and share of FP beneficiaries with citizen and end-users engagement mechanisms afters FP project

Social R&I uptake — Uptake and outreach of scientific results and innovate solutions co-created in the FP

Strengthening the uptake of innovation in society

Data needs: Collection of data at proposal stage on the roles partners (incl. citizen) in the projects, structured survey of beneficiary entities and tracking of uptake and outreach through patents and trademakers and media analysis.

Source: Horizon Europe Impact Assessment - SWD(2018) 307 final | Part 2/3⁽²⁶⁾

21. http://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-swfs_en.pdf.

22. Specific, Measureable, Achievable, Realistic, Time-bound. These were described in the SwafS WP 2018-2020, and taken into account by expert tasked with evaluating proposals.

23. <https://publications.europa.eu/s/IIWk>.

24. Recently supported projects include GRRIP (Grounding RRI practices in research performing organisations) and GRACE (Grounding RRI Actions to Achieve Institutional Change in European Research Funding and Performing Organisations).

25. <https://eige.europa.eu/gender-mainstreaming/toolkits/gear>.

26. https://ec.europa.eu/info/sites/info/files/swd_2018_307_f1_impact_assesment_en_v6_p2_977548.pdf.

“Open Science, Open Innovation, Open to the World” (2015)

“Notions such as ‘user innovation’, as coined by Eric von Hippel, emphasize the role of citizens and users in the innovation processes as ‘distributed’ sources of knowledge. This kind of public engagement is one of the aims of the Responsible Research and Innovation programme in Horizon 2020.”

“Citizen Science is often linked with outreach activities, science education or various forms of public engagement with science as a way to promote Responsible Research and Innovation.”

“Citizen Science can contribute to the Commission’s goal of Responsible Research and Innovation, as it reinforces public engagement and can re-direct research agendas towards issues of concern to citizens.”

Examples of institutional changes supported by the Science with and for Society programme

The focus on ICs is not lost in Horizon Europe. In addition to a point under the Strengthening the ERA part on modernising universities and research organisations, the notion can also be found in the societal impact pathway for Horizon Europe under ‘Engagement – Number and share of FP beneficiaries with citizen and end-user engagement mechanisms after FP project’. This presupposes that the demand for co-creation activities in Horizon Europe will lead to corresponding IC adaptations in beneficiary organisations.

RRI and Open Science

Looking back on the period starting in 2014, one cannot ignore the contribution made by the Commissioner for R&I, Carlos Moedas, who opened the conference in Rome and the exchange with Member States at the Council meeting on the Rome Declaration⁽²⁷⁾. Although RRI has not been the main axis of his strategy, he later made the links explicit in his 3Os strategy.

OS, centred on the ‘science system’, includes citizen science⁽²⁸⁾ among its eight priorities. The Open Science Policy Platform (OSPP), gathering the main R&I stakeholders, and the EC have committed to producing toolkits for citizen science. In addition, the SwafS WP 2018-2020 made citizen science one of its five strategic orientations, with more than EUR 50m of funding being made available.

Citizen science is blooming across disciplines, notably thanks to the possibilities offered by ICT. It is a beneficial practice in many respects to RTDI stakeholders, and an activity that often bridges the worlds of R&I. It helps researchers to access knowledge and data, citizens to explore questions and issues they care about, policy makers to have a better idea of citizens’ interests and concerns⁽²⁹⁾, monitor regulatory compliance⁽³⁰⁾, and assists companies (e.g. those that are part of the pharmaceutical industry).

Like other parts of Open Science and RRI, citizen science faces a number of challenges. These include resistance, lack of awareness, or simple inability by the established ‘science and education system(s)’ to engage with citizen science. Others include proving to a sometimes sceptical audience that its data are credible, sustaining funding, and maximising the societal benefits of its activities. Other stakeholders also need to step up. This includes helping civil society organisations (CSOs) to understand that they can - and should - play a role in R&I, and the EC, which will need to take renewed measures to attract newcomers to R&I such as CSOs⁽³¹⁾.

27. See <https://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2015451%202014%20INIT> and http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/intm/146048.pdf

28. https://ec.europa.eu/research/openscience/pdf/integrated_advice_opsp_recommendations.pdf#view=fit&pagemode=none.

29. See the EC pilot experiments with projects such as VOICES, CIMULACT or NewHorRizon.

30. See, for instance, Citizen science for environmental policy. Available at <https://doi.org/10.2779/961304>.

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As the Open Science strategy becomes fully operational (e.g. Plan S for Open Access, European Open Science Cloud), one should not oppose it with RRI as the two should be considered different tools for achieving complementary goals: Open Science as the tool for opening up the science system, and RRI as the tool for breaking down R&I silos and opening the door to the collective intelligence of society. Citizen science is an important modality for both. Yet there are differences: science education and gender equality are integral to RRI but barely mentioned as part of Open Science. Likewise, scientific rewards and incentives are barely part of RRI, but integral for moving towards Open Science. And we should not forget that their underlying histories, narratives and modalities make a simple synthesis of the two next to impossible.

Horizon Europe will be an evolution of H2020, and neither SwafS nor RRI will be in the next FP in 2021 in the same way as they are in H2020. Yet RRI’s philosophy, narrative, rationale and tools will have to be found across Horizon Europe if we want the programme, not least the R&I missions and clusters, to be successful⁽³²⁾. How can we get plastic-free oceans without citizens, industry, policy makers, and other actors contributing their knowledge and capacities and behaving differently? We cannot achieve the SDGs without citizens and institutions transforming the ways they behave and sustaining those changes. So let us help them to change with Open Science and RRI.

31. The bar for CSO involvement in the FPs is set rather low – as attested to by the study “Network analysis of civil society organisations’ participation in the EU Framework Programmes”. See: http://ec.europa.eu/research/swafs/pdf/pub_public_engagement/ki-04-17-578-en.pdf.

32. See, for instance, “Opinion on ‘Responsible Dual Use’ Political, Security, Intelligence and Military Research of Concern in Neuroscience and Neurotechnology”. Available at: https://sos-ch-dk-2.exo.io/public-website-production/filer_public/f8/f0/f8f09276-d370-4758-ad03-679fa1c57e95/hbp-ethics-society-2018-opinion-on-dual-use.pdf.

33. The 2019 SwafS call for citizen science proposals received 68 proposals for 4 funding opportunities.

Final considerations and suggestions

A touchstone of RRI is that R&I is a single system and that all parts of society should be jointly involved to produce better outcomes from this system. The quadruple model, or even the quintuple helix model given our increased understanding of climate change and environmental constraints, are frequently suggested as ways forward. Both imply that there is no single deficit holding back R&I, but capabilities spread across society that need to be recognised, engaged and valorised.

The next decade from 2021 to 2030 will be crucial to achieving the SDGs. R&I will have a say and citizens will have a say too. And Horizon Europe will have particular responsibility for harnessing all the energies towards the SDGs. H2020 has shown that it is possible to mainstream RRI in evolving RTDI stakeholder organisations and help them to launch ambitious multi-stakeholder, transdisciplinary projects. Citizen science, in particular, is on the rise as evidenced by the huge interest expressed in citizen science topics in SwafS⁽³³⁾.

As the ‘polishing’ of Horizon Europe continues, no final conclusion can be drawn yet. But from what is known a number of points can already be suggested, potentially beneficial *inter alia* to research and higher education organisations:

1. SwafS is the political beacon and home of citizens and CSOs in FP8⁽³⁴⁾; in its absence, the mainstreaming of RRI will have to be taken one step beyond what has been achieved in H2020. Given the importance of RTDI institutions in conducting and fostering RRI and the limits of project-based approaches, continued support for ICs in stakeholder organisations should be pursued.
2. Horizon Europe will continue to support all five RRI dimensions and citizen science should be promoted across the programme, particularly in the missions and clusters. The citizen science toolkits being developed by the EC with the OSPF should help maximise the benefits of citizen science for both R&I and society.

3. It is difficult, if not impossible, to develop accurate intelligence or effective policy responses without data, and such RRI monitoring activities should be continued and made use of by funders, applicants and evaluators of RTDI activities. The progress made by the MoRRI project⁽³⁵⁾ in measuring the evolution and benefits of RRI will be pursued by the SUPER_MoRRI project until the end of 2023. MoRRI’s basket of indicators can already be used as a tool to examine the transformation of RTDI practices.
4. Proximity is a powerful ally of RRI, as experience with citizen science shows, and not everything can or should be done at the EU level. Reflections and (re)actions are needed by other governance levels in the ERA, perhaps, above all, at regional and local levels. The excellent pilot projects towards territorial RRI (including in the Outer-Most Regions of the EU)⁽³⁶⁾ show the way forward in fields as diverse as climate change, biodiversity and science education.
5. Policy makers and other RTDI stakeholders should encourage rather than hinder synergies between RRI, Open Science and user-led innovation. Different policy goals call for different responses. Commonalities between policies do not necessarily mean that any are redundant.
6. Along with citizen science, the EC and Member States should foster ‘science and society literacy’ in the ERA, i.e. awareness that the link between science and society is precious for our future. All people and organisations bearing responsibility for knowledge dissemination, and above all higher education organisations, should contribute to the ‘science and society literacy’ of the present and future generations.

RRI practitioners will have to adapt and help RRI to evolve as it spreads, deepens and adapts to the needs of RTDI stakeholders who work towards the SDGs. If RRI does not evolve, it will not survive. And if RRI does not survive, will we survive it for very long?

“A goal without a plan is just a wish.”

Antoine de Saint-Exupéry

Achieving the SDGs is the goal. RRI is the plan.

34. <https://publications.europa.eu/s/IIWk>.

35. <http://morri-project.eu/>

36. TERRITORIA, TERRIFICA, SeeRRI & FORWARD. Interreg has also recently begun to explore RRI as a way to improve regional development processes, e.g. MaRIE and ROSIE.

The Multidisciplinarity of Science and its Processes of Socially Responsible Transformation

Bartolo Cruz

Abstract

Currently, the generation of knowledge is being addressed by disciplines organised as a subject called multidisciplinarity, which integrates such concepts as sustainability, equal opportunities and equity, among other principles that demonstrate that the need for multidisciplinary collaboration has increased in recent decades to jointly address critical problems related to the well-being of human populations. In this context, we might ask we are to understand socially responsible multidisciplinary research today, and what changes does it require to be made to the current protocols and ways of doing research? To answer these questions, this chapter presents an analysis of the challenge that implies a new way of transforming the thoughts and actions of global scientific society. The development of skills that respond to global problems related to guaranteeing food safety, water availability and the generation and use of clean energy in the long term have been considered as strategies. Conclusions and recommendations are presented on the implementation of participatory methodologies in science, which predict positive effects in dealing with the social, economic, political and environmental problems facing our planet today. Finally, we also discuss the challenges of multidisciplinary research aimed in terms of achieving the Sustainable Development Goals.

“It is the first civilisation in the history of the human race that spans the entire globe and firmly binds together all human societies, submitting them to a common global destiny. It was this science that enabled man, for the first time, to see Earth from space with his own eyes, that is, to see it as another star in the sky” (Havel 1994).

The origin of multidisciplinary research is associated with the concept of sustainable development in terms of the existing link between economic and social development and their effects on the environment (Brundtland 1987). The realisation that these components of the development of societies are so closely related dates

back to the United Nations and the creation in 1983 of the World Commission on Environment and Development (Brundtland Report). In the wake of this report, leading figures from the scientific, political and social spheres joined the mission, representing the diverse interests of the international community, to deal with shared problems related to valuation of our actions on the planet, as well as the present and future consequences for environmental, economic and social matters. It is therefore felt that the capacity to keep working for the common good has increased the need for multidisciplinary collaboration, and various case studies have emphasised experiences and discussed some of the challenges for socially responsible multidisciplinary research. At the same time, globalisation and technological development have raised new challenges for the protocols and operational methods of science, whereby there is a social demand for ethical behaviour in research, which needs to be committed to its surroundings and whose general ethical, economic and environmental duty is to maximise common wellbeing in order to comply with the 2030 Agenda and the Sustainable Development Goals. Within this context, the inclusion of multidisciplinary in research represents a challenge that is imposing new changes to the way that science thinks and acts on a global level.

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Before going on to look at the approaches related to multidisciplinary science, and an analysis of research protocols and operational methods, we believe it relevant to analyse the different concepts of disciplinary knowledge and their implications in terms of multidisciplinary, interdisciplinary and transdisciplinarity within the framework of the development of the knowledge society.

Disciplinary knowledge

The term comes from the Latin *discere* (learning) and was used since antiquity with little distinction from the concept of learning (Henao et al. 2017). However, that conception has since evolved and now refers to a way of ordering knowledge for teaching purposes, but from a single point of view and with the prevailing focus on the teacher's side and methods used to inculcate knowledge (Stichweh 2003). For the purposes of analysis in this document, the focus is from the practical understanding that *"knowledge seeks to identify, structure and above all use information to obtain a result, but requires the application of one's intuition and wisdom to the said information"* (Medina et al. 2011).

Multidisciplinarity

The Random House College Dictionary (1975, 1997) defines this as *"Composed or made of several specialised bands of knowledge or fields of expertise, in the search for a common objective"*. For the Real Academia Española (2019) the concept corresponds to: *"That which covers or affects various disciplines"*. Rosenfield (1992) mentions that multidisciplinary projects are those in which researchers representing different areas of knowledge contribute methods and ideas from their own disciplines towards an analysis or response to a particular research question. The above considerations reflect criteria in common agreement, related with the presence of several disciplines of knowledge with a shared goal, but also reflecting the autonomy of each of the methodologies, always from the perspective and interest of knowledge, since there is a technical benefit without involvement of subjectivity (Henao et al. 2017).

Interdisciplinarity

This concept is defined by the Real Academia Española (2019) as *"[Study, project, etc.] that requires the participation of several disciplines"*. The Random House College Dictionary (1975, 1997) considers this concept to be *"Combining or involving two or more academic disciplines or fields of study; or two or more professions, technologies or departments"*. However, the most accurate definition of the research process is considered to be that proposed by Bernard (1995) and Flinterman

(2001). These authors mention that *"an interdisciplinary team aspires to a more profound level of collaboration [than a multidisciplinary team], in which constituents of different backgrounds combining their knowledge mutually complete different levels of planned care"*; such that *"interdisciplinary research is a collaboration of several disciplines, but in this case concepts, methodologies, or epistemologies are explicitly exchanged and integrated, resulting in a mutual enrichment"*.

Transdisciplinarity

Through transdisciplinarity, we hope to attain reciprocal knowledge and a complex understanding that will never be concluded, but aspires to long-lasting discussion and intervention over time. According to (Rosenfield 1992) *"transdisciplinary projects are those in which researchers from different fields not only work closely together on a common problem over an extended period but also create a shared conceptual model of the problem that integrates and transcends each of their separate disciplinary perspectives"*. Flinterman et al., (2001) mention that it is *"a specific form of interdisciplinarity in which boundaries between and beyond disciplines are transcended and knowledge and perspectives from different scientific disciplines as well as non-scientific sources are integrated"*. What these focuses are trying to tell us is that transdisciplinarity does not eliminate disciplinary knowledge. What it discards is the claim that disciplinary knowledge is totalising and it shifts the disciplinary focus into one that crosses it, i.e. it is transdisciplinary.

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The differences between the aforesaid conceptualizations agree on the need to enrich scientific heritage; and to assume a collective perspective that is not restricted to the disciplines or their fields of action. The idea is to seek union while continuing to view the world as a heterogeneous unit. The purpose is not for it to be separated, even though differences can be distinguished. In agreement with this perspective, Nicolescu (1996), comments that *"we go back to the pressing need to suggest, live, learn, and teach a complex thinking, that can interweave disciplines as a possibility of a complete*

mankind; only like that, the eternal limitation and fragmentation of the subject separated from himself in the search of knowledge would be overcome". So, socially responsible multidisciplinary represents the aspiration to the most complete knowledge possible, which is able to enter dialogue with the plurality of human knowledge.

Understanding current research protocols and procedures

The current analysis of training programmes for science practitioners shows that, globally, there is a strong ideology for change guided towards socially responsible multidisciplinary research. This implies a different approach to the discipline and training of science teachers and professors, guiding them to towards becoming autonomous, reflective scientists that research their own individual endeavours (Camacho et al. 2010); but without neglecting the challenge for the future, which is move away from introspection and accept the responsibility of becoming a leader and co-participant within the multidisciplinary scientific system. Faced with this challenge, a simultaneous parallel model is an option, whereby disciplinary knowledge can be integrated and, as Chun Wei (2010) says, the greatest achievements come when practitioners have participated in training that is disciplinary or focused on broadening their disciplinary knowledge, but integrated in the practice of teaching in an environment of continuous professional collaboration. Therefore, like many other problems faced by contemporary societies, the difficulties of doing research require concerted and integrated action involving greater cooperation between all parties to achieve our common goal, which is "the development of knowledge as an instrument for achieving Sustainable Development" (UNESCO 1995). The challenge now is greater, and even more so than the individualisation of research, as a process of introspection has arisen in recent years, and which has partly been the result of the training of scientists being over-focused on their own pressing problems. These problems might remain unintelligible if professional training institutions do not go back to participating in our society's debates on issues like global citizenship, the culture of peace and sustainable human development.

The role of universities in the transformation of research protocols and operational methods

The importance of the function of universities lies in the professional training they offer and which generally boosts their students' knowledge. This is the kind of education that has the most direct and fundamental repercussions for extending and improving on the education received at schools. However, higher education is one of the oldest forms of education in our society. Universities have a long and portentous history, and have endured and prospered through all kinds of circumstances.

So it is not hard to imagine that universities, over the centuries, have gone through times just as difficult as those that they face today. The need to make changes in order to operate effectively, both now and in the future, implies that these institutions must focus on the essential area of higher professional education, which consists of assuming direct responsibility for others, and having a major influence that is put at the service of our societies. This service does indeed require careful and fundamental attention, and to a certain extent it is subject to the academic quality of the courses it offers; and this has indeed become a cause for concern in many countries, because the quality of higher education has gone substantially downhill in recent years. That aside, the most important thing universities can do for the public sector is to provide adequate training to men and women, and for students to enjoy the freedom to do research in accordance with the dictates of their intelligence (UNESCO 1995). Without the active cooperation and participation of all parties involved in higher education (students, universities, governments and private initiatives), it will be impossible to achieve any substantial improvements to cope with the changes in the political, socioeconomic and environmental spheres, and which are calling for a new approach to the problems of contemporary research, namely multidisciplinary. With this in mind, we can rightly deduce that the adoption of the Sustainable Development Goals by decision-makers in the field of research will only be achieved if all the stakeholders take them on board as their own. It is evident that the scientific community is already fully involved in this change process, since scientific research has shifted its priorities to focus more

and more on problem-solving in response to urgent developmental challenges (UNESCO 2015). This change in research priorities is clearly reflected in the educational profiles that are currently being designed and offered at most universities in the world, in awareness of the complementarity of science, which implies that each participant should focus their contribution on the areas in which they can contribute the most knowledge in relation to what others can offer, and to thereby offer innovative solutions to the challenges that humankind will face on the road to Sustainable Development.

The interconnection of science as an effective strategy for doing research

The complexity of science can be interpreted as an expanding network in which scientific ideas, researchers and documents evolve (Fortunato et al. 2018). This is due to the growing availability of scientific output, and funding for research, productivity and partnerships. Such activities can be viewed as unprecedented opportunities to explore the structure and evolution of science, in which the results with the greatest impact are those that originate from groups with similar characteristics. But when these groups are small teams, science tends to be misrepresented. In contrast, large teams of researchers tend to generate high-impact results, but they are often short-term groups working on specific research goals. However, some global problems, such as climate change, have had a marked impact on the evident absolute relationship, intimate connection and the perfect coupling of society with science and technology, generating positive results for universal development and application to the environment, and it is multidisciplinary science that is being used to that end. So, we need to abandon the concepts of triumphalist or traditional 'scientistic' science (which aspires to a linear form of development), and evolve towards a plural, democratic and technologically advanced science, the essential model for establishing effective growth strategies.

Some global problems, such as climate change, have had a marked impact on the evident absolute relationship, intimate connection and the perfect coupling of society with science and technology

There is no doubt that recent times have witnessed a turning-point for science in the field of research; essentially in terms of research of human development and of multifactorial problems that can only be solved from different scientific perspectives. Within this trend, different disciplines are looking to generate new knowledge using their own tools, techniques, methods and theories. However, there is something that each of the disciplines has in common: not one of them in particular responds comprehensively and globally to any given phenomenon. What this means is that, in general, there is a void within the disciplines, which could well be filled by other disciplines. So, it is important to continue the development of participatory methodologies (PM) to foster a direct relationship with the research goal. These methodologies expand upon the outlines of reality, based on the permeability between the truths of each field of knowledge, and which clearly imply the need for a real and concrete approach whereby the disciplines can fill the inherent voids in each of the others (Figure 1).

Figure 1. Participation in multidisciplinary research by each of the disciplines of knowledge. Modified by Narváez (2015).



If work groups manage to gain basic stability and use PM in their everyday work, with practice, the outcome will surely be better quality research. Nevertheless, it might be a better idea to first undergo rudimentary self-training, beginning with interdisciplinary approaches to research, before moving on to more complex multidisciplinary methods.

As a strategy to promote coordination between scientific disciplines, it has been proposed that skills should be developed that respond to the biggest global problems, namely those related to guaranteeing safe food supplies, water resources and long-term energy use, as well as for human communities to be protected from natural disasters and trained to be resilient. The responsibility for this falls on institutions at all levels and in all sectors of society. To address this problem, some areas have been generated from different disciplines that involve knowledge from both the so-called basic sciences and from the applied sciences (Leal 2006).

This cohesion of science is beginning to produce an increasingly higher number of multidisciplinary projects, i.e. programmes that bring together several research groups from different areas of knowledge to work together towards a common scientific goal: human well-being. In this regard and according to (Van den Besselaar 2001) it can be argued that research involving the application of knowledge derived from environmental disciplines is the predominant form of multidisciplinary research. Such research typically involves a very similar communication system to that observed in their disciplinary fields of origin (usually environmental crises of natural and anthropic origin). We should note that the image of a scientific system that reflects the natural and social domains may be just one of various possible types that follow a multidisciplinary pattern, since the emerging fields of research, according to UNESCO (2015), are those corresponding to education, basic sciences and sustainable technological development. It will therefore be important to adopt the 'open science' concept through the use of such technology as the internet, which paves the way for online research collaboration, as well as open access to publications and big data. These scientific elements and tools support multiple disciplines, providing them with basic physical, biological, socioeconomic and geographical information. These databases allow scientists to store large amounts of information for use in participatory research, and also make it possible to analyse the behaviour of these elements, thus supporting the generation of a more complete vision of reality. This latter aspect refers to the incorporation of the concepts of object-oriented databases, which provide many benefits for different research topics and purposes. For example, on the issue of food, countries are becoming more aware of their natural capital, such that global investment in sustainable technologies has increased, thus also raising the value of natural capital in national economies, and in domestic planning too, but always with a firm commitment to Sustainable Development in order to maintain competitiveness in international markets that are inclined towards green technologies. We should also note that green growth is a rising trend as countries look to implement the new Sustainable Development Goals framed in the 2030 Agenda. We can also observe a relationship between basic and applied sciences with new technologies, which are viewed as highly promising for improving the research tendencies of universities, organisations, institutions and associations that are inclined towards multidisciplinary

research. All these activities require the creation of networks to group the required potentialities and specialties in areas such as the sourcing and assessment of new protocols that are calling on research to produce extraordinary results that will lead to benefits for stakeholders and social communities, who need to be provided with an effective service and the best solutions to a shared problem arising from the revolution in socially responsible research processes.

Final considerations

As a final consideration of the analysis presented in this paper, it is safe to say that socially responsible multidisciplinary research is currently facing a major process of global change involving a variety of disciplines and requiring joint research protocols and operational methods among different scientific parties. The critical areas where integrated work is most needed are those related to the greater well-being of human populations, their resilience and their ability to meet the Sustainable Development Goals. In a time of major scientific and technological changes, and international economic integration too, it is through their capacity for unification that nations will be able to prosper. The positive results of science, based on evidence taken from a wide range of scientific knowledge, have come about as the result of the successful combination of different disciplines, leading to successful learning in order to deal with the social, economic, political and environmental issues that are challenging our planet today. The new tools of multidisciplinary science, such as participatory methodologies (to cite just one example) augur far-reaching implications that will lead nations towards prosperity. However, we need to correct and reduce the limitations on multidisciplinary collaboration, for we often observe how such good intentions are not ultimately represented in researchers' scientific endeavours, i.e. the generations of complex scientific programmes are too far removed from areas of professional work and are only viewed as a second option when it comes to designing joint research protocols. Some of the reasons for this lag in scientific collaboration could be geographical (physical distance between groups with intentions to collaborate), scientific (not seeing a clear research goal or being reluctant to participate in already established lines of research), personal (distrust of working with scientists from areas of little or no affinity), cultural (conception of science from polit-

ical, religious and other perspectives) and commercial (economic interests: central and peripheral countries). This has meant that in many cases the generation of research protocols and operational methods by multidisciplinary work teams is still very scarce. However, in recent decades, confidence in teamwork has increased, representing a fundamental change in science. (Fortunato et al. 2018) mention a study of 19.9 million research articles and 2.1 million patents that have been produced by multidisciplinary teams from all branches of science. We must therefore be convinced that this kind of collaboration can be framed within the training of new researchers at universities, involving processes that take a reflective (think of the common good) and not instructive (disciplinary) approach, in order for them to truly contribute to the development and well-being of human societies, in analogy with all the other biotic and abiotic stakeholders on this planet, for the sole purpose of gaining a better understanding of the conception and future of societies.

References

- Brundtland, G.H. (1987) *Our common future*, Oxford: Oxford University Press.
- Camacho, J. P., Jiménez, J., Galaz J. A. & Santibáñez, D. (2010) La Formación de profesores de Ciencia en el mundo: una revisión In Cofré, H. (ed.) *Cómo mejorar la enseñanza de las ciencias en Chile*, Santiago, Chile: Ediciones UCSH, pp. 19-40.
- Chung Wei, R., Darling-Hammond, L., Andree, A., Richardson, N., & Orphanos, S. (2010) *Professional Learning in the Learning Profession. A Status Report on Teacher Development in the U.S. and Abroad*, Technical Report. School Redesign Network: Stanford University.
- Díaz Rojas, H. (2014) Las ciencias sociales en la sociedad del conocimiento, *Diálogo andino*, 45, pp. 3-4.
- Flinterman, J., Teclemariam, M. R. & Broerse JEW. (2001) Transdisciplinary: the new challenge for biomedical research. *Bull Sci*, 21, pp.253-66.
- Fortunato, S., T. Bergstrom, C., Börner, K., et al. (2018) Science of Science. *Science*, 359, p. 6379.
- Havel, V. (1994) *Post-modernism: the search for universal laws*. Liberty Medal.
- Henao Villa, C., García Arango, D., Aguirre Mesa, et al. (2017) Multidisciplinariedad, interdisciplinariedad y transdisciplinariedad en la formación para la investigación en ingeniería. *Revista Lasallista de Investigación*, 14 (1), pp. 179- 197.
- Leal Egaña, A. (2006) Equipos multidisciplinares: el siguiente paso de la ciencia, *Journal of Technology Management & Innovation*, 1 (2), pp. 21-26.
- Medina, V., Pérez, J. & Torres, J. (2011) *La investigación en Ingeniería: ciencia y tecnología de la información y del conocimiento*, Bogota: Universidad distrital Francisco José de Caldas.
- Narváez, N. S. (2015) Hacia la investigación multidisciplinar e interdisciplinar: reflexión sobre la aplicación de metodologías participativas y la investigación acción participativa en las ciencias sociales, *Humanismo y Cambio Social*, pp. 74-82.
- Nicolescu, B. (1996) *La transdisciplina. Manifiesto*. Monaco: Du Rocher.
- Peña, A. (1995) La investigación científica en México. Estado actual, algunos problemas y perspectivas. *Perfiles Educativos*, 67.
- Rosenfield, P. (1992) The potential of transdisciplinary research for sustaining and extending linkages between the health and social sciences. *Soc Sci Med*, (35), pp. 1343- 57.
- Stichweh, R. (2003) Differentiation of scientific disciplines: Causes and consequences. UNESCO, *Encyclopedia of Life Support Systems*, Paris, 8.
- The Random House College Dictionary (1975) New York: Random House.
- UNESCO (2015) Science Report: towards 2030 – Executive Summary. Paris, France, p. 45.
- Van den Besselaar, P. (2001) The cognitive and the social structure of Science and Technology Studies, *Scientometrics*, 51, pp. 441-460.

Case Study — Experimental Practices: Humanities and Arts in the Process of Modeling Knowledge for Data-Based Society

Agnieszka Jelewska and Michał Krawczak

Accelerating progress in the development of technological tools, the achievements of the sciences, and above all the ways of collecting and modeling data, are significantly changing the mechanisms of knowledge construction. In the data-based society (Gillespie T., et.al. 2014; Ebeling M, 2016), the model of which is in the process of being defined, knowledge is generated on the basis of ‘big data’, which are then subject to multi-level processes of management, modeling and interpretation. Therefore, it is said, with increasing frequency, that many of the scientific questions on researchers’ agendas now require collaborative research. The new humanities, together with related artistic-research practices, are becoming a crucial part of the process of analyzing and interpreting such data, with a focus on their social and cultural impact.

We created the Humanities/Art/Technology Research Center at the Adam Mickiewicz University in Poznań in 2010 in order to search for effective strategies for conducting research on new social and cultural phenomena associated with the data-based society, and to explore the possibilities of new didactic methods. Hence, both these perspectives (research strategies and didactic methods) have determined the focus of the center’s activity for almost 10 years.

Transdisciplinary methods, which we use extensively, are based on collaborative work involving specialists from various disciplines – including designers and artists, as well as people from outside of academia. Another key element of such methods is the use of various forms of scientific data and research results, which, during the course of the work, are repeatedly processed and analyzed from very different perspectives. Transdisciplinarity neither entails the specialists in a team simply cooperating, with everyone remaining safely within their area of competence, nor is it just an attempt to mix disciplines – but rather consists of combining knowledge systems

and developing a shared direction for research development (Allen W., et.al. 2014). Transdisciplinary strategy, especially when developed in relation to humanistic research, does not involve speculating on the basis of scientific theories or the creation of new metaphors, but rather the inclusion of new research perspectives in the analysis of a problem.

Case Study

An example of our transdisciplinary research is our exploration of the spectral character of the Chernobyl disaster (A. Jelewska, M. Krawczak, 2018), which, as a complex case study, cannot be subsumed under any particular scientific discipline (research on the disaster was conducted in the fields of radiology, geology, biology, genetics, environmental studies, psychology, sociology, cultural studies, political science, post-soviet studies, medicine, and many others). The case study itself constitutes a transdisciplinary research object. Therefore, data on a catastrophe are scattered across different disciplines, and in this case even the data itself – such as radiological readings obtained by different types of measuring instruments – are not only of exclusively scientific significance, but are also cultural artifacts in their own right. In this nexus, the long-term consequences of a disaster determine the environment, both in terms of its biological, geological and atmospheric sphere, as well as its political, economic, energy, social and cultural sphere. Moreover, the long-term duration of a disaster and its evolving consequences also have an impact on the changing research disciplines and measuring instruments themselves; therefore, new readings and new data are directly linked to the culture in which they appear, at the level of social, political, media and artistic experience. In our research, an important perspective is provided by

STS (Science-Technology Studies), posthumanism and various ecological concepts that enable the inclusion of so-called non-human actors in the field of research, and the acquisition and analysis of data about the disaster and its social and cultural consequences on their basis.

Research Grants

The research presented above has been conducted within the framework of the many grants we have obtained, including the completed *Algorithms of New Democratization. Polish Art of Digital Era*. (ed. Jelewska A. 2014); and the ongoing *Art as Laboratory of the New Society. Cultural Consequences of the Post-Technological Turn*⁽¹⁾ is a research project that aims to explore the relationship between European society and modern laboratory knowledge in the context of the post-technological breakthrough; and *Mediated Environments. New practices in humanities and transdisciplinary research*⁽²⁾ focuses on the work of multi-disciplinary research groups in various scientific laboratories, and attempts to develop experimental models for transdisciplinary issues such as cyber-agriculture, network distributions of palm oil, and the consequences of deep-sea mining for future generations.

Art&Science

Since 2010, we have carried out many projects, some of which were artistic experiments – such as the 2012 *Transnature is Here exhibition*, where we persuaded artists to cooperate with scientists and grapple with the latest scientific theories in the fields of biology, cognitive science, bioacoustics and social robotics. In 2015, together with a team of architects, media artists and composers, we created the *Post-Apocalypsis* system, using the method of weather data sonification, which was exhibited at the Prague Quadrennial of Performance Design and Space. The system addressed the issue of ecological changes under the influence of energy disas-

1. *Art as Laboratory of the New Society. Cultural Consequences of the Post-Technological Turn, 2014-2020*, PI: Agnieszka Jelewska, Co-PI: Michał Krawczak, Co-PI: Jacek Wachowski, founded by Polish National Science Centre, (grant no. UMO-2014/13/B/HS2/00508)

2. *Mediated Environments. New practices in humanities and transdisciplinary research*, 2016-2021, PI: Agnieszka Jelewska, Co-PI: Michał Krawczak, founded by Polish Ministry of Higher Education (grant no. 0014/NPRH4/H2b/83/2016).

ters and the possibility of studying the human factor as an element of causality (Jelewska A., 2015, Krawczak M., 2015). The intersection of art and science is now proving to be one of the essential spaces for experimenting with new methods of translating scientific facts, and also for critical intervention based on acquired knowledge in a specific area. Additionally, what connect artistic and scientific activities are data operations, hence their common transdisciplinary dimension.

Workshops and Studies

The transdisciplinary tools and strategies developed in the framework of our research are later used in the teaching process – in university classes and workshops where researchers, artists, designers and activists are trained together. The HAT Research Center is one of the entities responsible for conducting an MA in Interactive Media and Performance studies (Adam Mickiewicz University), in which the project-based learning method is applied, with a special focus on field-research methods and critical design. As part of the curriculum, in addition to traditional academic courses, students work on socially relevant case-studies. Thanks to the combination of such curricula with the direction of research carried out at HAT Research Center, it is now possible for us to continually implement new elements and transform our didactic methods. On the other hand, the workshops within which transdisciplinary teams are put together (usually composed of representatives of various scientific disciplines, artists, designers, as well as social activists) enable us to develop new methods of cooperation in a transdisciplinary group and to develop somewhat different research issues from scientific and social perspectives, using technologies and experimental artistic practices. In recent years, for example, we conducted the *Emotional Urban Weather* (2015) workshops on sound ecology, communication and locational disorders in the post-technological city, and *Hyperobjects* (2017), which focused on the issue of individual participation in environmental research, and on forms of eco-activity and building social responsibility.

In a global world where knowledge is based on collecting, processing and preserving data, the humanities and artistic-research practices provide an opportunity to experiment extensively with ways of analyzing and interpreting these data, taking social, economic, political and cultural factors into account.

Laboratory and experimental activities for the new humanities are projects combining artistic and scientific practices – allowing for a new way of prototyping solutions, experiences and, what is equally important, a critical discourse for the data-based society.

References

Allen W. (2014). Bridging Disciplines, Knowledge Systems and Cultures in Pest Management, [in:] “Environmental Management” Vol. 53, issue 2, pp. 429-440.

Ebeling M.F.E. (2016). Healthcare and Big Data Digital Spectres and Phantom Objects, Palgrave Macmillan.

Gillespie T., Boczkowski P.J, Foot K.A. ed. (2014), Media Technologies. Essays on Communication, Materiality, and Society, MIT Press.

Jelevska A. (2015). Post-Apocalypse [in] Post-Apocalypse, Zbigniew Raszewski Theater Institute, Warsaw 2015, pp. 7-14.

Jelevska A., Krawczak M. (2018). The Spectrality of Nuclear Catastrophe: The Case of Chernobyl, EVA Copenhagen 2018 - Politics of the Machines - Art and After, <http://dx.doi.org/10.14236/ewic/EVAC18.30>

Jelevska A., ed. (2014). Art and technology in Poland. From cyberculture to the culture of makers. Adam Mickiewicz University Press, Poznań 2014.

Krawczak M. (2015). Ecosystem of Post-Apocalypse, [in:] ibidem, pp. 14-18.

14. Is the democratisation of science through ‘Open Science’ and ‘Open Data’ feasible? How can it be effective? What are the implications of the concepts of academic autonomy and freedom at universities? How are these two concepts configured in order to deal with current challenges?

Open Science: A Cultural Change for Universities

Paul Ayrís and Ignasi Labastida

Abstract

In 2014 the European Commission launched a public consultation on Science 2.0, aimed at assessing awareness of new ways of performing research, at identifying opportunities and challenges, and at planning policies and actions to enable uptake of Science 2.0 activities by European researchers. At that time, these new ways of doing science were tagged as Science 2.0, but they have since been renamed Open Science.

The result of that public consultation was the deployment of European policies to acknowledge, reward and foster such activities. Initially the focus of research funders' policies was publications, but it has since moved to research data. However, the actions of sharing research outputs beyond peers and bringing science closer to citizens and society in general must be accompanied by changes in incentives and rewards for researchers. There is an urgent need to change the way we assess research.

Universities, as one of main places where research is performed, must be actively involved in all these changes and they must play a fundamental role in all discussions. Institutions can be conservative and reluctant to make changes, but they cannot just wait and see. In this article we would like to review some of the recommendations we have already identified in the LERU Roadmap for Open Science [1] and point out some ideas on how to implement them. Apart from all these recommendations and implementations, we suggest that what is needed is a broad cultural change in our institutions to achieve Open Science principles: to make research more transparent and accessible.

Introduction

In the last decade, many researchers have adopted new ways of doing research, probably with the help of new tools, new skills and new collaborations. These new activities challenge institutions and funders in the way they acknowledge and reward researchers. Moreover, many of these new activities are aimed at bringing research closer to society, which seems a fair goal, especially for public universities and funders. All these new research activities and the way their results are disseminated are known collectively as Open Science. We may view Open Science as a movement aimed at changing the way research is performed, disseminated and assessed.

Open Science practices and principles can be applied to any step of the research cycle: planning and designing, performing, disseminating, or re-using. Therefore we can approach the issue from many perspectives. One of the most common of those is to define areas of work. The European Commission has identified eight pillars of Open Science⁽¹⁾:

- The Future of Scholarly Publications
- FAIR Data
- The European Open Science Cloud (EOSC)
- Rewards and Incentives
- New generation metrics
- Education and skills
- Research Integrity
- Citizen Science

If we want to make science more open and transparent, and to bring it closer to society, all stakeholders must work in these areas. However, some of these eight pillars can be grouped. For instance, as universities we can work on making our data FAIR and at the same time make

1. Collected from: <https://ec.europa.eu/research/openscience/index.cfm>; last accessed 22 April 2019

them available in the EOSC. And we can work on rewards and incentives by defining a new generation of metrics that will help us to deliver a fairer research assessment.

When LERU published its Open Science Roadmap for universities in 2018, it added a ninth pillar: cultural change. The actions needed in each of these eight pillars require global change at an institutional level. Institutions must lead the change, and find an answer to three questions. First, who is going to lead the change? Second, how is that change to be managed? What is the plan? Third, how will the research community be supported in introducing the changes to thought and practice that Open Science requires. Cultural change to deliver Open Science, therefore, requires “Leadership, Management and Engagement”.

Disciplinary differences add to the challenge of fostering cultural change in academic organisations. This tension arises in many places among the 8 pillars of Open Science, as defined by the European Commission. For example, for Arts and Humanities, the product par excellence of academic research is the research monograph. Arts and Humanities scholars feel that current changes in scholarly publishing patterns in the wake of Open Science largely affect journal articles, rather than books. As such, there is a perception that current changes in scholarly publishing advocated by Open Science champions are driven by the Sciences at the expense of the Arts and Humanities. Even the term ‘Open Science’ does not automatically mean anything in the Anglophone world where the word ‘science’ is used for a subset of disciplines that does not include the Arts, Humanities and Social Sciences. ‘Science’ on the European continent is used in its Latin sense of ‘scientia’, knowledge or understanding, across *all* academic disciplines. Thus, the statue of Minerva in the courtyard of the Rectorate of the University of Turin calls Minerva ‘dea della scienza’, or the goddess of wisdom. The use of the phrase Open Science in an English speaking world can therefore divide academics rather than unite them.

The same tension can be found in the field of research data management. Many Arts, Humanities and Social Science scholars do not understand how any of their outputs can be characterized by the phrase ‘research data’. These are often perceived as terms used in the physical and biological sciences, and the view is that they are not easily transposed into the Arts and Humanities, whose scholars may well have audio recordings of

interviews, or scanned versions of archival documents, or photographs of historic architecture. But scholars do not use the phrase ‘research data’ to characterize the genre of such outputs. Nor do historians of ideas or philosophers always consider that they produce any evidence at all that can be considered research data. They think and record their ideas. They do not assemble ‘research data’ as such.

There is a perception that current changes in scholarly publishing advocated by Open Science champions are driven by the Sciences at the expense of the Arts and Humanities

And, finally, we can also find tension when discussing the concept of reproducibility, a key element in the openness and transparency that Open Science brings to the area of research data. In the physical and biological sciences, for example, reproducibility – the ability to replicate experimentation or findings – is important for showing the integrity of research processes and results. But ‘reproducibility’ is not a phrase that is generally understood by the Arts and Humanities and some Social Sciences. Historians, for example, are not usually asked in a PhD viva whether their work is reproducible. Instead, they may be asked about the rigour of their investigative methods, or the completeness of the base evidence they have used. Using the phrase ‘reproducibility’ in such a context again feeds the perception that scientific methodologies are being forced on the Arts, Humanities and Social Sciences in the guise of Open Science. Not a helpful perception.

Taking those tensions into account, in what follows, we will review how universities can act and change in each of these aforementioned areas to adopt Open Science practices and principles.

Shaping the future of scholarly publications

The Open Access movement took off more than fifteen years ago with the publication of three declarations (Budapest, Bethesda, and Berlin⁽²⁾) that have become the foundations of the movement. Before these three decla-

2. The texts of the three declarations are available at <https://legacy.earlham.edu/~peters/fos/overview.htm>; last accessed 22 April 2019

rations, there were already some initiatives in place like ArXiv⁽³⁾, the well-known preprint repository for physicists and mathematicians. However, the launch of the Budapest Open Access Initiative (BOAI) was the starting point of current open access alternatives. The BOAI proposed two strategies to achieve the ultimate goal: to have all publications publicly available without barriers. Those two strategies are currently known as the two roads to open access. On one hand, we have the call on researchers to self-archive any published peer reviewed paper in thematic or institutional repositories, and, on the other hand, we have the proposal to create new journals or to transform existing ones into publications that use copyright – not to close but to open up their contents. These two strategies are respectively known nowadays as the green road and the gold road.

Universities have mainly followed the green road by developing institutional repositories and establishing institutional policies mandating or recommending their researchers to deposit a copy of any published paper. Public and private funders have also established requirements to support this option. Even governments have enacted laws, like the Spanish Law on Science, Technology and Innovation⁽⁴⁾, requiring self-archiving by researchers on the premise that tax payers must have access to the results achieved by research projects paid with public funds.

The idea behind the green road has always been to provide an open alternative to the paywalled access offered by publishers. However, this strategy has not become a real threat to publishers, as deposition rates were not high enough to become a real alternative. At the same time, publishers imposed restrictions to follow this road based on copyright transfers signed by researchers. The two main restrictions are the limitation to make only the authors' manuscript available (the final peer reviewed version without the final published layout), and the establishment of a delay in making it available, known as an embargo period that can be within a range of six to sixty months from the date of publication. Generally, embargoes last from twelve to twenty-four months, depending on the journal, the publisher and the discipline (Björk, Laakso, Welling and Paetau, 2014).

In 2012, the British government commissioned a report from a group of experts chaired by the sociol-

ogist Dame Janet Finch. Known as the Finch Report, it marked a turning point by clearly choosing the gold road to achieve full open access. However the report indicated that the transition would be costly because the current system, based on the subscription access model, would still exist for a few more years. Although we should not identify gold open access with a single business, the most successful one has been that based on payment for publishing. These payments are mainly made by funders or institutions through research projects and specific funds. Traditional publishers reacted to this commitment to gold open access by providing a new publishing system: the hybrid model, through which researchers can make their contributions open in a paywalled journal by means of an extra payment. The fees paid through the hybrid model have had no impact on the price of subscription, leading many to accuse publishers of double dipping (Mittermaier, 2015). Publishers also established longer embargo periods than the ones allowed by funders when opting for the green road, offering the hybrid model as a suitable compliant option for immediate open access to a publication.

In some countries, especially in the United Kingdom following the recommendations of the Finch Report, spending on publications has increased dramatically, especially using the hybrid model (Pinfield, Salter and Bath, 2016). Like the green road, the hybrid model has not been a threat to publishers, who have gained a new stream of revenue as a result.

Last September, a coalition of national research funders published Plan S,⁽⁵⁾ which aims to become the ultimate policy to drive change towards a full open access scenario. In fact, the plan is a set of ten principles that will initially be applied, according to current thinking, in 2020. The publication of Plan S brought many reactions in its wake, both positive and negative, along with uncertainties that funders tried to clarify with the publication of a guide and by opening a two-month public consultation procedure. Currently, Coalition S is analysing the feedback received, but they are still strongly committed to pursuing the idea that open access should be immediate on publication regardless of where an output is published: a journal or a repository, or even in new publishing platforms supported by funders or universities, as we will see later.

3. <https://arxiv.org/>; last accessed 22 April 2019

4. Law 14/2011 available in Spanish at <https://www.boe.es/eli/es/l/2011/06/01/14/con>; last accessed 22 April 2019

5. Plan S is available at https://www.scienceurope.org/wp-content/uploads/2018/09/Plan_S.pdf; last accessed 22 April 2019

While Open Access is gaining momentum, some traditional publishers have reacted by offering new agreements to research institutions, which include access to read the existing content along with the offer of publishing new papers as open access. This new model, called Read and Publish, is offered as a neutral cost shift to research institutions, especially in countries like Germany, the Netherlands and Sweden where existing contracts expired and research institutions and governments were committed to moving to full open access, even by cancelling access to subscription journals if need be.

As universities, we need to get as much data as possible about where our researchers are publishing, how many articles are published in open access, and who is paying for opening up articles following the hybrid model. We can assume that a neutral cost shift is achievable, but do we want to continue paying these sums or do we really want to change the system?

Some initiatives are already challenging the current system. Many universities have joined collaborative publishing platforms like the Open Library of Humanities⁽⁶⁾ that pursues a publishing model that is not based on a fee for each publication, but on providing a sustainable venue supported by common funds. Other universities like the UCL (University College London) have set up their own presses to offer viable open access publishing platforms. The initiative at UCL followed the transformation of the university press into a fully open access publisher. UCL Press⁽⁷⁾ is now a benchmark for the implementation of open access publishing platforms. It produces open access monographs and textbooks, has launched a megajournal platform⁽⁸⁾ and is developing a new textbook platform.

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At the same time, research funders are providing their own platforms where their grantees can publish their results in several formats, not just as texts. In 2017, the Wellcome Trust was the first funder to offer this option⁽⁹⁾ as a recommendation. The Bill and Melinda Gates Foundation followed⁽¹⁰⁾ and even public funders like the Irish Health Research Board have established their own publishing platforms⁽¹¹⁾. At the end of 2018, the European Commission failed to deliver on its own public tender to establish such a venue. All these new platforms are challenging universities that still rely on journal-based indicators when assessing research, as we will analyse in the section dedicated to evaluation. These platforms initially publish non-peer reviewed texts, but the resulting peer review process is performed openly online and can make available not only the identity of the reviewers but all their comments and observations. Authors can create as many versions of their outputs as required, and finally a validated peer reviewed text is publicly available.

Making research data FAIR and participating in the EOSC

In order to make research reproducible, the publication of results as journal articles alone has been proven to be inefficient (Stevens, 2017). This is one of the reasons why funders and publishers are requiring researchers to publish and share any material underpinning their published results. Among these materials, research data is the most common item to be shared.

Sharing research data, however, is not just about uploading meaningless spreadsheets that no one can understand. It requires researchers to provide data with clear metadata that humans and even machines can understand and re-use. Following this idea, in 2016 a group of researchers published an article establishing four principles for sharing research data (Wilkinson et al., 2016), namely that data must be findable, accessible, interoperable and reusable. These four words have become the acronym FAIR.

In recent years, researchers have been discussing ways to implement these FAIR principles and the debate is still

6. <https://openlibhums.org/> (last accessed 22 April 2019)

7. <https://www.uclpress.co.uk/> (last accessed 22 April 2019)

8. <https://ucl-about.scienceopen.com/> (last accessed 22 April 2019)

9. <https://wellcomeopenresearch.org/> (last accessed 22 April 2019)

10. <https://gatesopenresearch.org/> (last accessed 22 April 2019)

11. <https://hrbopenresearch.org/> (last accessed 22 April 2019)

not over. However we can point out some of the possible implementations. Research data must be identified individually by means of permanent uniform identifiers such as a DOI (Digital Object Identifier), facilitating its findability and its citation. Research data should follow standard formats in each discipline, which may differ from one to another. When publishing data, the terms of reusability must be clear and data should be as open as possible, and as closed as necessary.

When data cannot be made publicly available due to confidentiality, security, privacy or ethical issues then metadata must be public in order to allow researchers and the public to know of the existence of this data and, in some cases, there may be ways to access them in a more restrictive way, under individual agreements.

Universities must establish research data management policies aimed at assisting researchers to share data following the FAIR principles. These policies must be different from the ones already established for publications because they should not automatically mandate the deposit of data in institutional repositories. Research data policies must determine the right framework by establishing roles, responsibilities, services and infrastructures. Moreover, institutions should develop data management training programs for all researchers at a university, as we will see in the following section on education and skills.

Universities must establish research data management policies aimed at assisting researchers to share data following the FAIR principles

In some cases, instead of building new individual infrastructures, it will be possible to join existing infrastructures or partner with other research institutions to develop collaborative facilities. In any case, all infrastructures must follow a common set of international standards to allow the creation of a network that connects them together. This is the ultimate goal of the creation of the European Open Science Cloud (EOSC)¹², a pan-European initiative just launched in November 2018 that aims to make research data more discoverable and reusable.

Initially, the EOSC was designed to federate existing ESFRI, but universities are looking to find a way to establish a presence there by providing research data that

will augment that already shared in those subject-based infrastructures. The long tail of data that we have in our institutions must be tackled. As research institutions willing to spread the knowledge we have amassed, we must pursue the goal to make our data available as open data and the EOSC offers us an opportunity to do so.

Education and skills

Open Science is an opportunity to make research more open and transparent and, therefore, we should train all the members of a university in these new practices. Universities must identify early adopters and champions and establish training programs at all levels. Researchers must be trained, but also all support staff from librarians to project officers. Moreover, Open Science offers the chance to establish new career profiles that can be built into current curricula and into new degrees. For instance, there will be a need for people to curate research data, a role called data stewardship. These new profiles will be a mix of current skills from the following communities: data scientists, librarians, computer scientists, and researchers specializing in each academic discipline.

Data literacy should be included in many of the current curricula without delay because it is clear that future researchers should be ready to manage and curate their data to make them FAIR.

Many universities are developing training sessions along with their Doctoral Schools to raise awareness among PhD students about Open Science, but we need to train senior researchers and supervisors too. Otherwise, these young researchers will not be able to utilize their newly-acquired skills in collaborative research work. Again, here we see a clear need to make a global cultural change to the whole institution if we want to succeed in transforming our institutions into Open Science leaders.

12. <https://www.eosc-portal.eu/about/eosc> (last accessed 22 April 2019)

Improving research evaluation systems and preserving research integrity

The uptake of this new way of doing science needs to be accompanied by a change in rewards, incentives and assessments. The established norm is for researchers to be evaluated on where they publish using journal-based indicators, rather than focusing on the quality of the performed research. Auditing the number of publications is easier and cheaper than reading and assessing them. These systems rely on the evaluations of editors and administrators rather than any real academic assessment.

Another important failure of current evaluation systems is that they are focused only on disseminating research results in publications. Researchers are now publishing data, code and methods, and these outputs do not fit easily into classical evaluations. This situation is critical when these new outputs are cited and re-used by colleagues, thus becoming a core part of the research process.

In trying to find new ways to evaluate research and get rid of this dependence on publications, two main initiatives have emerged in recent years calling for a change in research assessment methods. The first was developed in 2012 during the annual meeting of the American Society for Cell Biology in San Francisco, from where it receives one of its names, the San Francisco Declaration. Its official name is the Declaration on Research Assessment (DORA)⁽¹³⁾ and it has been signed by many individuals and institutions. Three years later, in 2015, the Leiden Manifesto was published in *Nature* (Hicks, Wouters, Waltman, de Rijcke and Ràfols, 2015), establishing ten principles to change current practices in research evaluation.

DORA advocates for the elimination of the use of journal-based indicators and provides recommendations to all stakeholders involved in research evaluation. It calls on research performing institutions to be explicit about the criteria used in internal evaluation, to consider all kinds of research output and to include qualitative indicators in any evaluation process. In a similar way, but less belligerently with regard to the impact factor, the

10 principles of the Leiden Manifesto call for the use of qualitative assessment, where quantitative indicators support qualitative judgements. The purpose of such developments is to protect local research, to analyse and regularly update the indicators used, and to improve the information provided to researchers about their evaluation.

In some cases, institutions sign or support these declarations or statements but they do not implement their principles. Signing a declaration might be easy, but implementing it is certainly not. It is common to hear that making radical changes to internal assessments can undermine researchers in external evaluations. However, universities have some degree of independence that allows us to introduce progressive modifications to our internal assessment procedures to include some Open Science principles. Leadership means exploring new paths and that is what a leading research institution must do – test, analyse and learn. Such institutions that take the lead will shape new ways of assessing research in the near future.

If we change the way we evaluate research, we may need new indicators. For instance, current metrics are not sufficient to measure societal impact. However, this impact cannot be measured just by looking at the attraction that a paper or research output has in social media. That is the reason why there has been a replacement of terms when we discuss this topic. For a while, the term “altmetrics” was used but it was identifiable with a specific commercial product. That is the reason why we now use the term ‘next generation metrics’, although it is recognised that we need more than a numerical figure to assess the quality of research. Good evaluation needs to mix qualitative and quantitative assessment, and to be linked to disciplinary norms.

The establishment of new evaluation methods is a key factor for achieving a change in the way research is performed and disseminated, but we must also emphasise the importance of research integrity. Unfortunately, we often hear about plagiarism or fraud involving researchers. These misbehaviours have probably always existed, but today they are easier to track and discover. If our objective is for society to have trust in our institutions, we must react actively and not remain passive.

As universities, we must pursue integrity in all our activities and especially in research and establish tight norms against any bad practice. By promoting codes

13. <https://sfedora.org/read/> (last accessed 22 April 2019)

of conduct and best practices, we can establish clear rules to avoid fraud, plagiarism and other misconduct.

Rewards

One of the best ways to encourage change in an organisation is to look at appointment, induction and appraisal processes in order to ensure that Open Science approaches are duly rewarded. Open Science represents a significant change in how research is undertaken, shared and evaluated. As a result, it is important that reward and promotions schema at an institutional level recognize this change and stipulate processes that will reward open approaches by academics. The depth of the change that Open Science brings to reward schema marks this as one of the most difficult areas of current practice to change.

Open Science represents a significant change in how research is undertaken, shared and evaluated. As a result, it is important that reward and promotions schema at an institutional level recognize this change and stipulate processes that will reward open approaches by academics

An example of good practice in this regard can be found in a number of European universities, for example UCL (University College London) in the UK. There, the Academic Promotions framework⁽¹⁴⁾ has been changed so that openness can be one of the criteria to be used in assessing individuals for promotion. Open Access to outputs is taken as a core requirement and academics are invited to show how they have embraced this concept with open access to their publications, open research data or open source software. The framework also makes explicit reference to DORA, stressing that the best way to evaluate research outputs is through qualitative judgement. Numerical metrics should only be used as an adjunct to individual assessment, not as a replacement for it.

14. Document available at <https://www.ucl.ac.uk/human-resources/sites/human-resources/files/ucl-130418.pdf> (last accessed 22 April 2019)

Improving Society's Participation in Research

Finally, we must stress that one of the goals of Open Science is to make research more meaningful to society. Among some researchers, there is a growing interest in involving citizens in research activities. Technology allows anyone to provide support to researchers when gathering or classifying data. Many projects have developed applications that any person can download and install on their personal devices, which enable them to start providing or classifying research data. However, Citizen Science goes beyond these practices. The contributions of citizens can be more significant at any step of the research cycle. Some researchers are already including patients or students in focus groups when designing a research study (Benedictus, Miedema, Ferguson, 2016) and (Senabre, Ferran-Ferrer and Perelló, 2018).

Some of the activities performed in a Citizen Science project do not fit into standard curricula and that is why a change in the way we evaluate them is urgent. This is because these activities are also research actions. This was one of the points included in the 10 principles that the European Citizen Science Association (ECSA) launched in 2015⁽¹⁵⁾. In this document, there is also a call to acknowledge the citizens involved in these projects and to make public all the data and metadata resulting from research. As universities, we must provide infrastructures and programmes to develop Citizen Science projects and activities. Currently, when the value of science is being doubted, any process for opening research up to society can reinforce the authority of science and allow informed debate.

Some of the activities performed in a Citizen Science project do not fit into standard curricula and that is why a change in the way we evaluate them is urgent

15. Available in multiple languages at <https://ecsa.citizen-science.net/engage-us/10-principles-citizen-science> (last accessed 22 April 2019)

Conclusions

We have seen that Open Science aims to bring research closer to society by following many paths.

From the above, it will be seen that a move to deliver Open Science at an institutional level is feasible and realistic. As the LERU Roadmap underlines, the key to successful delivery is strong leadership. The changes that Open Science brings in its wake help to redefine the role and purpose of a university in society. Nor does Open Science inhibit academic freedom. Properly understood, academic freedom is not a licence to free oneself from responsibilities and obligations. Rather, it is itself a call for responsibility, generosity and engagement. Viewed in this light, Open Science is closely aligned with the objective of academic freedom in an educational and research environment.

The laudable goal of embracing Open Science concepts and practices involves many changes at the institutional level and universities need to make cultural change happen in order to adopt these new practices and principles. There are many opportunities and challenges and each institution must develop its own roadmap by defining its areas of interest and prioritizing them. Some universities are better placed than others because they have already developed policies, but all of them must begin to initiate change. Now that society is demanding more transparency and accountability, and science is facing a crisis of trust, Open Science principles may allow research institutions to strength their role as a pillar for the creation and dissemination of knowledge. Let's start the journey!

References

- Ayris, P.; López de San Román, A.; Maes, K. and Labastida, I. (2018). *Open Science and its role in universities*. LERU. Available at: <https://www.leru.org/publications/open-science-and-its-role-in-universities-a-roadmap-for-cultural-change> (last accessed 22 April 2019)
- Benedictus, R.; Miedema, F. and Ferguson, M. W. J. (2016). Fewer numbers, better science. *Nature*, vol. 538, pp. 453-455, doi:10.1038/538453a
- Bjork, B.; Laakso, M.; Welling, P. and Paetau, P. (2014). Anatomy of green open access. *Journal of the American Society for Information Science and Technology*, vol. 65, pp. 237-250, doi:10.1002/asi.22963
- Hicks, D.; Wouters, P.; Waltman, L.; de Rijcke, S. and Rafols, I. (2015). The Leiden Manifesto for research metrics. *Nature*, vol. 520, pp. 429-431, doi:10.1038/520429a
- Mittermaier, B. (2015). Double dipping in hybrid open access – chimera or reality?. *ScienceOpen Research*, doi: 10.14293/S2199-1006.1.SOR-SOCSCI.AOWNTU.v1
- Pinfield, S.; Salter, J. and Bath, P. A. (2016). The ‘total cost of publication’ in a hybrid open-access environment: Institutional approaches to funding journal article-processing charges in combination with subscriptions”; *Journal of the Association for Information Science and Technology*, vol. 67, pp.1751-1766, doi:10.1002/asi.23446
- Senabre, E.; Ferran-Ferrer, N. and Perello, J. (2018). Participatory design of citizen science experiments”; *Comunicar*, vol. 54, pp. 29-38, doi: 10.3916/C54-2018-03
- Stevens, J. R. (2017). Replicability and Reproducibility in Comparative Psychology. *Frontiers in Psychology*, vol. 8, p. 862, doi: 10.3389/fpsyg.2017.00862
- Wilkinson, M. D. et al. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data*, pp. 160018; doi: 10.1038/sdata.2016.18
- Working Group on Expanding Access to Published Research Findings. (2012). Accessibility, sustainability, excellence: how to expand access to research publications. Report available at <http://www.researchinfonet.org/publish/finch/> (last accessed 22 April 2019) Mittermaier, B.; “Double dipping in hybrid open access – chimera or reality?” *ScienceOpen Research*, 2015; doi: 10.14293/S2199-1006.1.SOR-SOCSCI.AOWNTU.v1

Part 6

Impact

15. How can ideas that may not fit easily into current education indicators, such as intuition, peripheral thinking and cooperative problem solving, be evaluated? What are the positive and negative effects of rankings on humanities, on science and on technology? Which need to be reviewed and which should be promoted?

Assessing the Impact of Humanities, Science and Technology: How to Fill the Gap?

Emanuela Reale

Abstract

Impact assessment has gained momentum in the last ten years because policy makers need evidence about the contribution that the investment in research, development and innovation produces on science and society. The aforementioned policy drift is having a powerful effect on academic research and on Higher Education Institutions, pushing individuals and organizations involved in R&D&I activities to go beyond the search for quality to also consider the effects generated by their efforts on society. However, both finding a comprehensive definition of what impact is, and how it can be represented through sound and reliable assessment instruments are not easy tasks. The aforementioned problems are more important in certain fields of science, Humanities first and foremost, because it is hard to disentangle their contribution to science and society using measurements of scientific results (e.g. citations) or economic advancements (e.g. patenting activities) from an input/output approach. The difficulties to justify the utility of investment in Humanities produced on the one hand, a new prioritization of areas of knowledge within universities, and a tendency to marginalize Humanities in favor of other areas that are supposedly more productive and useful. On the other hand, Humanities scholars often adopt a defensive behavior vis-à-vis impact assessment, which tends to isolate them.

The paper seeks to shed light on how impact can become an important means for improving the understanding of the social value of Humanities, and how Humanities are an essential instrument to complement knowledge produced by STEM (science, technology engineering and mathematical) research. Using advancements produced by the literature and results derived from field research, it seeks to answer the following questions: how far can the impact of Humanities be assessed using methods and tools of other fields, namely the STEM ones? What kind of approach might improve the integration of knowledge produced in different disciplinary areas and the generation of effects on science and society? How can we fill the gap between Humanities and Science Technology?

Introduction

Impact assessment has gained momentum in the last ten years because policy makers need evidence for the contribution that investments in research, development and innovation make to science and society. The aforementioned policy drift is having a powerful effect on academic research and on Higher Education Institutions, pushing individuals and organizations involved in R&D&I activities to go beyond the search for quality to also consider the effects generated by their efforts on society.

However, both finding a comprehensive definition of what impact is, and how it can be represented through sound and reliable assessment instruments are not easy tasks. These problems are more important in certain fields of science -humanities first and foremost, because it is hard to disentangle their contribution to science and society using measurements of scientific results (e.g. citations) or economic advances (e.g. patenting activities) from an input/output approach. The intrinsic 'reflexivity' of humanities, and the difficulties to justify the utility of investment in these fields produced, on the one hand, a new prioritization of areas of knowledge within universities, and a tendency to marginalize these areas in favour of others that are supposedly more productive and useful. On the other hand, scholars often behave defensively vis-à-vis impact assessment, claiming they have an impact that is usually indirect and long term, thus making it difficult to attribute it to particular achievements (Weinghart and Schwechheimer 2007), which tend to be isolated.

Both finding a comprehensive definition of what impact is, and how it can be represented through sound and reliable assessment instruments are not easy tasks

The paper aims to shed light on how impact can become an important means to improve the understanding of the social value of Humanities, and how Humanities are an essential instrument to complement knowledge produced by STEM (science, technology engineering and

mathematical) research. Referring to advances cited in the literature and results derived from field research, it seeks to answer the following questions: how far can the impact of Humanities be assessed using the methods and tools of other fields, namely STEM? What kind of approach can improve the integration of knowledge produced in different disciplinary areas and the generation of effects on science and society? How can we fill the gap between Humanities and Science/Technology?

Background and methods

In recent years, political requirements have led both governments and intermediary public funding agencies to increasingly seek accountability for the scientific and broader societal impacts of the research that they support. At the same time, researchers and research institutions are asked to provide evidence of these impacts and this requirement has been incorporated in national massive evaluation exercises –the Research Excellence Framework-REF being the main example among European countries. This has been accompanied by a growing demand from research users within civil society for researchers to be accountable for the value of research for society (Beck 1992). In fact, a literature review on impact (Reale et al. 2018) shows that evaluation is often driven by the policy makers' need to demonstrate the value that public investment in this area generates for increasing the country's competitiveness, excellence, wealth creation, productivity, and social well-being.

Despite the different meanings and the debate around a proper definition, impact is generally understood as a change that research outcomes cause to the scientific community, the economy, and society at large. This poses the problem of attributing the effect to the research effort, and of capturing effects produced at a time that might be very far removed the moment when the research outcome was generated. Reviews of the literature (Reale et al., 2018; Penfield et al. 2014) have also emphasized the relevance of discipline-specific research evaluation. It is a matter of fact that at national and cross-national levels, research evaluation and research policy tend to be designed from the perspective of the life sciences and the natural sciences, with the specific features of social sciences and humanities commonly being neglected (Donovan 2005). On the contrary, scholars involved in the evaluation of Social Sciences and Humanities (SSH) point out that

impact “is not limited to the instrumental ‘use value’ that SSH research may provide for certain user groups, but is wide-ranging through the implicit embeddedness of SSH within society, provided that it remains open to society, and its power to analyze and explain social phenomena and to contribute to overcoming societal drawbacks through a diversity of discourse and exchange levels and formats. These aspects can be dealt with distinctively, albeit they are interrelated.” (Koenig et al. 2018; see also Felt 2014). Thus, the first gap between STEMs and Humanities is about the definition of what impact is and how it is likely to be represented through measurements and indicators.

Impact is generally understood as a change that research outcomes cause to the scientific community, the economy, and society at large

As to methods and instruments for the evaluation of impact, the main divide was traditionally between quantitative versus qualitative approaches, the former being supposedly more adept at evidencing outcomes derived from usage and identifying the economic return of research investment from an input-output approach, while the latter is more adept at highlighting processes and ‘productive interactions’ between actors that are likely to generate an impact in terms of creating societal value and anchoring new knowledge to existing institutions (Molas Gallart and Tang 2011; Molas Gallart 2015; Benneworth 2015). New tools for process-focused social impact assessment have been proposed, to identify conditions and elements that make a research effort relevant for society, and the types of engagement that scholars demonstrate to generate an impact through research work (Bastow et al. 2014). Following this different perspective, both quantitative and qualitative approaches are feasible –on condition that they include evaluation designs, criteria and indicators that take on board the differences between fields generating new knowledge. Although the process is also crucial for capturing the impact of STEMs, there is a gap as far as the identification and implementation of indicators is concerned, and an understanding of the impact of Humanities research needs bottom-up procedures to grasp the intrinsic diversity of the field, rather than extrinsic indicators of what impact should be (Ochsner et al. 2017). Moreover, impact can emerge through long-term processes dealing with the diffusion of cultural changes and new perspectives to under-

stand society, which are difficult to grasp in the short time that policy makers have to make decisions. Here it is worth mentioning the effort to build new metrics to assess the research impact of SSH. Besides the widespread opposition to bibliometrics, other metrics -data from national and international datasets, tools dealing with new metrics such as Altimetric and infrastructures, appeared, dealing with impact assessment practices (SAGE Publishing 2019). These new attempts warrant further considerations because they are useful to sustain certain types of evidence-based assessment.

Both quantitative and qualitative approaches are feasible -on condition that they include evaluation designs, criteria and indicators that take on board the differences between fields generating new knowledge

One further gap is related to stakeholders' involvement in research activities through a) co-creation of knowledge between academics and non-academics, b) discussion and dissemination of research results after their production in order to stimulate their use, and 3) collaboration in the research design in order to unpack the research objectives into sub-tasks, which are more manageable for producing usable results (Reale et al. 2019). Different involvements lead to different models of interaction -from collaboration to public engagement, from the knowledge 'creeping' into society model to the mobility model (Muhonen et al. 2018). However, Humanities have a specific feature, which is also peculiar with respect to Social Sciences, identifying the stakeholders' involvement in interactions, and the role they can assume given the highly fragmented methods used, and the different epistemic bases driving knowledge production and results achieved. For instance, one important element is the difficulties for SSH stakeholders to become salient to Universities, because they lack three main characteristics, namely power, legitimacy and urgency (Benneworth and Jongbloed 2010). Thus, it is the network of relationships in which universities are situated that can improve their responsiveness to stakeholders.

The perspective of the pathway of impact production can help to fill the aforementioned gaps; it is a formative approach focusing on the translation of actors involved in the research, which cooperate in the development of the desired outputs, outcomes and impact that the research effort should generate, on the basis of their

specific interests, identifying, through a bottom-up process, indicators and signals of the effects achieved (Walker et al. 2008; Joly et al. 2015). This approach -also applied to STEMs, adopts a learning perspective, going beyond accountability and considering impact as a 'black box' that needs to be opened; the main methodology is the case study, whereby assessment can be focused on 'vectors' producing impact in different institutional and field contexts (Bozeman and Sarewitz, 2011), combining the use of qualitative and quantitative tools (Oancea et al. 2017). The identification of impact pathway is particularly promising where the assessment of research projects is concerned; this is one of the most critical areas of evaluation because Humanities are often involved in interdisciplinary research efforts, and an understanding of their contribution to the impact achieved by the project can be extremely difficult to achieve, and there is a risk of underestimation of the importance of their participation.

Good practices

We can outline here few examples of good practices in order to more specifically address the gaps highlighted in Section 2.

If we look at the experience of the European Framework Programmes, and particularly the last, Horizon 2020, it has been observed that SSH integration with other STEM fields dominated the Commission's efforts and debate as a cross-cutting issue to be addressed, and also driving the evaluation of the proposals: "The Commission set up measures for better integrating SSH into the other six Societal Challenges as well as into other parts of Horizon 2020, meaning that its routines and procedures were amended in a way that funding calls could require participation of SSH partners. Such calls would be "flagged" and participation of one (or more) SSH partners would be rewarded through better evaluation scores." (Koenig 2019). The Commission assessing SSH integration considered indicators related to the composition of the advisory boards established for each Societal Challenge, the share of topics that are flagged for SSH integration during the design of the Work Programmes, and the amount of funding distribution to SSH research beyond the flagging (Koenig 2019). Despite the positive effects of the aforementioned measures, they led to more prominent involvement of social science research in the EUPPs and more stable

networking, than they did in the case of Humanities, whose integration still requires more effort.

Examples of good practices are also visible in the analysis conducted as part of the IMPACT-EV project⁽¹⁾, which developed 22 case studies on successful experiences of projects dealing with SSH research, producing social impact, funded under European Framework Programmes VI and VII. The case studies reported that research on SSH contributed to direct social impact, showing evidence of positive achievements; in some cases, evidence of advances in the state of the art along the lines of the indicators originally chosen by the project were also shown. However, either there were no robust indicators to demonstrate the supposed impact or the absence of baseline data made the representation of the progress hard to justify through objective measurements as was the case for STEMs. This is not surprising, as indicators of progress are more related to political, epistemological, and ethical aspirations seeking to change the existing social structure and remedy problems affecting society (improving the level of education, sharing social democratic visions, integrating vulnerable communities, etc.); in the case of Humanities, the effects were even more subtle and hence difficult to assess through measurements, because they deal with epistemic values and identity creation between and within communities. In most cases, the ability to demonstrate the indirect effects of research efforts was very limited, despite the positive perceptions among the scholars and stakeholders involved.

Another positive achievement emerged in the case studies of the IMPACT-EV project in relation to the problems of attribution and causal relationship between the effect observed and the contribution of research, affecting impact evaluation of both Humanities and STEMs. The cases outlined that the involvement of stakeholders was a key element to trace the linkage between the observed effect and the contribution derived from the project research. Stakeholders' involvement was also critical for political impact - a special form of social impact, because interviews revealed that stakeholders are more effective carriers than researchers when presenting the positive effects derived from research results to policy makers, gaining trust and attention and possibly leading to transformative effects. In this respect key features favouring stakeholders' involve-

ment are: a) building a common language through a communicative methodology that allows for two-way exchange between researchers and non-academic actors, b) continuous involvement of stakeholders throughout the project in the different phases of knowledge production, not only in the dissemination phase, c) a clear theoretical background driving stakeholders' participation in the project activities and the role they are supposed to play (Reale et al. 2019).

Finally, it is worth recalling bottom-up initiatives at European level dealing with evaluation in Humanities and Social Sciences, such as the EvalHum Association on Research Evaluation Innovation and Impact Analysis for the Social Sciences and Humanities. EvalHum has two associated projects, EASSH European Alliance for Social Science and Humanities -whose mission is to promote "the importance and value of the social sciences and humanities (SSH) at all pertinent levels and through all relevant actions in Europe and beyond" (see art 3 of the EASSH Constitution), and the COST Action ENRESSH-European Network for Social Sciences and Humanities, which is devoted to proposing best practices for evaluation in the field of SSH. These initiatives are mobilizing the SSH scholarly community from different academic organizations to improve their evaluation methods and instruments, developing original conceptual approaches, data, methods and indicators, discussing the extent to which evaluation is able to provide positive feedback for improving research quality, and at the same time determining how far evaluation is able to improve reflexivity about the importance of SSH research for social advancements. Such initiatives, because they are derived from an internal self-governed process rather than a top-down initiative, bringing together the values and needs of a highly fragmented community, are likely to improve awareness of scholars' responsibility to foster impact and the importance of engaging in dialogue with stakeholders.

1. IMPACT EV project "Evaluating the impact and outcomes of EU SSH research" funded under the EU-FP7 - Grant n. 613202

Case 1 — Key ideas for Universities to fill the gaps in research project evaluation

Universities should be proactive actors in impact evaluation, promoting pilot evaluation experiences that are structured as a learning process, first asking what change the research is likely to produce on society. It is not a matter of using the research outcome, but how the outcomes can be incorporated in the structure of existing ideas, norms and values, setting a pathway toward transformative change.

Universities are in a privileged position for involving their stakeholders in the design to formulate evaluation questions through direct confrontation between the research findings and the capability of the findings to address their needs. In the case of Humanities this confrontation deals with cultural and cognitive improvements derived from research; interactions with stakeholders should help to build dialogue on the importance of the outcomes and of universities for structuring and anchoring values in society.

Pathways to impact assessment are not only a matter of making beneficiaries of research aware of the value of knowledge produced by universities, but also giving them and scholars involved in knowledge creation an arena to participate in and control the process that led to the generation of the outcomes derived from public investment in the research project. This would lead to an improved relationship with the contexts and the likelihood of SSH stakeholders becoming salient to universities.

Tools and methods must stress the combination of quantitative and qualitative evidence, thus making it possible to base the evaluative judgment on solid foundations, avoiding assessments based on false perceptions of positive or negative impact -or no impact at all, and it also helps universities to develop productive interactions and integration between scholars belonging to diverse disciplinary areas.

Recommendations

The literature and good practices referred to herein make certain recommendations that can be outlined from the evidence. These are mainly related to the impact assessment of research projects, because research developed under projects often has an applied focus and involves a broad consideration of impact as a goal to be achieved. Furthermore, research project evaluation is an issue that warrants special attention for several reasons. Project funding is a main instrument in research policy that mobilizes a large amount of resources. Successful bidding for research funding produces effects on a young researchers' career and on the prestige and reputation of research organizations and groups, and is a powerful means to enlarge networks and collaborations with scholars in the field. One further feature of research project funding is that it often addresses topics that need interdisciplinary approaches, involving scholars in SSH fields and STEMs. Thus, impact evaluation should be attentive to the following:

- Considering the process not the outcome alone when dealing with impact assessment of SSH research in order to understand the generative mechanisms of direct and indirect impact and to promote learning processes among the actors involved.
- Considering evaluation methods and instruments using the triangulation of different data and information. In this respect, case study methodology is an interesting tool for research project impact assessment.
- Considering stakeholders' involvement from the very beginning of the project and empowering them through participation in the evaluation process.
- Impact should be designed as a major objective of the project and not an afterthought. Management and organization of the research project should adequately consider dedicated resources, time and spaces for researchers and stakeholders' interactions.
- Adopting a bottom-up approach to identify intended impacts and the process to achieve them help to have a benchmark for impact assessment.
- Impact is important but should not be to the detriment of the quality and relevance of research. Trade-offs that might emerge between quality and impact achievements must be scrutinized and discussed carefully.

- Evaluation of the impact of SSH research must not ignore judgements about the overall achievements of the research under scrutiny, including the quality of the knowledge produced.
- The generation of impact is first and foremost a process of communication using adequate language to foster mutual exchange between academics and non-academics. The establishment of a communication strategy is a key feature for producing effects.
- Engagement of actors involved in the research project is a key element to produce long-term effects. Humanities should invest in raising awareness of the impact that their results might have to reinforce the likelihood of a cultural impact actually occurring.
- Barriers might constrain impact because the implementation of research results in real life might lead to changes that are not appreciated by the users or are not allowed by existing regulations and institutions. This is a common case in political impact; it is advisable to identify potentially problematic findings and put them at the core of confrontations with stakeholders in order to improve their ability to act for change.

Conclusions and final comments

The generation of social impact from the results derived from research efforts is hard, complex work with an uncertain outcome. All fields of science must face this challenge, which is now part of the new mode of knowledge production, but Humanities have some peculiarities that make it even more difficult to prove the effects that they generate on society because changes derived from their outcomes need time to emerge, and are mainly related to the shared values and identity of individuals and communities. Nevertheless, major commitment to engaging scholars and stakeholders in the use of research outcomes to address social needs is part of being responsible scholars.

There are no simple recipes for the achievement of impact that can be shared and implemented, but there is a path that needs to be pursued, involving a continuous learning process and much trial and error in order to create new opportunities and shed light on the value that new knowledge can offer to science and society. Universities have a key role to play in this respect.

References

- Bastow, S., Dunleavy, P. and Tinkler, J. (2014). *The Impact of the Social Sciences*. Los Angeles; London; New Dehli; Singapore; Washington, DC: SAGE
- Beck, U. (1992). *Risk Society. Towards a New Modernity*, London: SAGE
- Benneworth P., Jongbloed B. (2010). Who matters to Universities? A stakeholders' perspective on humanities, arts and social sciences valorisation, *Higher Education* 59, pp. 567-588.
- Benneworth, P. (2015). Tracing how arts and humanities research translates, circulates and consolidates in society. How have scholars been reacting to diverse impact and public value agendas?, *Arts and Humanities in Higher Education* 14 (1) pp. 45-60.
- Bozeman, B. and Sarewitz, D. (2011). Public Value Mapping and Science Policy Evaluation, *Minerva*, 49, pp. 1-23
- Donovan, C. (2005). The Governance of Social Science and Everyday Epistemology. *Public Administration*, 83/3, pp. 597-615
- Felt, U. (2014). Within, Across and Beyond: Reconsidering the Role of Social Sciences and Humanities in Europe. *Science as Culture* 23 (3), pp. 384-96. <https://doi.org/10.1080/09505431.2014.926146>
- IMPACT-EV (2017). Report 6.1 How social impact of SSH research is made visible, November, available at <http://www.impact-ev.eu>.
- Koenig, T, Nowotny, H. and Schuch, K. (2018). Impact Re-Loaded. Position paper at the Conference Pathways to Impact from SSH research, Vienna, November 2017, available at: https://www.ssh-impact.eu/wp-content/uploads/2018/06/Impact_Re-loaded_180614.pdf
- Koenig, T. (2019). *SSH-Impact Pathways and SSH-Integration in EU Research Framework Programmes*. IHS Working Paper n.5, Vienna, available at: <https://irihs.ihs.ac.at/5023/>
- Joly, B., Gaunand, A., Colinet, L., Laredo, P., Lemarié, S. and Matt, M. (2015). ASIRPA: A comprehensive theory-based approach to assessing the societal impacts of a research organization, *Research Evaluation*, 24, pp. 440-453
- Molas-Gallart, J. and Tang, P. (2011). Tracing 'Productive Interactions' to identify social impacts: An example for the social sciences. *Research Evaluation* 20(3), pp. 219-226

Molas-Gallart, J. (2015). Research Evaluation and the Assessment of Public Value, *Arts and Humanities in Higher Education*, 14(1), pp. 111–126.

Oancea, A., Petour, T.F. and Atkinson, J (2017). Qualitative network analysis tools for the configurative articulation of cultural value and impact from research, *Research Evaluation* 24(4), pp. 302-315

Ochsner, M., Hug, S. E. and Daniel, H. D. (eds) (2016). *Research and Assessment in the Humanities. Toward criteria and Procedures*. Switzerland: Springer

Ochsner, M., Hug, S., and Galleron, I. (2017). The future of research assessment in the humanities: bottom up assessment procedures, *Palgrave Communications* Penfield, T.

Baker M.J., Scolbe R. and Wykes M.C (2014). Assessment, evaluations, and definitions of research impact: A review. *Research Evaluation*, 23/1, pp. 21-32

Reale, E., Avramov, D., Canhial, K., et al. (2018) A review of literature on evaluating the scientific, social and political impact of social sciences and humanities research, *Research Evaluation*, 27(4), pp. 298-308

Reale, E., Fabrizio, S. and Morettini, L. (2019). Stakeholders' role to produce impact from Social Science research: what lessons for evaluation? Proceedings of the Austrian EU Council Presidency Conference on 'Impact of Social Sciences and Humanities for a European Research Agenda – Valuation of SSH in mission-oriented research', *Fteval Journal for Research and Technology Policy Evaluation*, Forthcoming

SAGE Publishing (2019). *The latest thinking about metrics for research impact in the social sciences* (White paper). Thousands Oaks, CA: Author.

Weingart, P. and Schwechheimer, H. (2007). Conceptualizing and Measuring Excellence in the Social Sciences and Humanities. Global SSH. <www.globalsocialscience.org>.

Assessing the Impact of Humanities in an Era of Rankings

Paulo Franchetti and Marcelo Knobel

Abstract

The locus of humanities is facing a crisis in terms of university structure. There is no need to even search for academic publications, but only to read the news. Everywhere one can find several interrogations, or clear proposals for the reduction or even extinction of universities. This trend probably has several origins, related to the current political situation all over the world, as well as an increasing mercantilist approach to higher education, even in public institutions. Furthermore, we believe that this tendency could be related to the emergence and increasing influence of rankings, and the consequent lack of understanding of diversity in different areas of knowledge. In humanities, scholarship happens rather slowly, and the impact of a publication can quite often be felt in different forms, taking years to eventually occur.

In Brazil, the situation is still rather comfortable for the humanities, but some signs of the worldwide trend are beginning to appear. The country still faces the challenge of increasing the number of enrollments in higher education, and the higher education sector has been growing continuously in the last 20 years, together with the need for well-trained faculty members. Furthermore, public universities, where most of the research is performed, are tuition-free, repelling (for now) the utilitarian arguments of tertiary education. On the other hand, the region's culture must also adapt to a more global approach, in order to increase its radius of influence and spread of ideas.

In this opinion chapter, we will discuss some possible ways to assess the influence and impact in the case of humanities, with local examples taken from the field of literary criticism. We also suggest some provocative approaches to assessing and stimulating production in humanities, which, in our view, are fundamental for the development of a better world.

Introduction

The locus of humanities is facing a crisis in the university structure. There is no need to even search academic publications, but only to read the news. Interrogations, or clear proposals for their reduction and even extinction can be found everywhere. This trend probably has several origins, related to the current political situation all over the world, as well as an increasing mercantilist approach to higher education, even in public institutions. Furthermore, we believe that this tendency could be related to the emergence and increasing influence of rankings, and the consequent lack of understanding of diversity in different areas of knowledge. In humanities, scholarship occurs at a rather slow pace, and quite frequently, the impact of a publication can be felt in different forms, sometimes taking years to happen.

In Brazil, the situation of the humanities is still quite comfortable, but some signs of the worldwide trend are beginning to appear

In Brazil, the situation of the humanities is still quite comfortable, but some signs of the worldwide trend are beginning to appear. The country still faces the challenge of increasing the number of enrollments in higher education, and so the higher education sector has been growing continuously for the last 20 years, with the need for well-trained faculty members. Furthermore, public universities, where most of the research is performed, are tuition-free, repelling (for now) the utilitarian arguments of tertiary education. On the other hand, the culture of the area also needs adapt to a more global approach, in order to increase its radius of influence and spread of ideas.

In this chapter, we will discuss some possible paths to assess the influence and impact of humanities, with local examples taken from the field of literary criticism. In addition, we will suggest some provocative approaches to assess and stimulate production in humanities, which, in our view, are fundamental for the development of a better world.

The humanities are in crisis in modern-day academia. In order to appreciate this, there is no need to review academic publications. One can simply read the newspapers to gauge how the humanities are faring in the public eye. For over a decade, not only have several questions been raised regarding the humanities and their importance and place in post-secondary institutions, but concrete proposals have been suggested for their decline and extinction. Several years ago, the Japanese government recommended that universities take “active measures to eliminate organizations [of social and human sciences] or convert them into areas that best meet the needs of society.” (Dean 2015). In response, well over 50 universities in Japan have eliminated or drastically reduced their social and human science departments (Dean 2015). In the United States, humanities departments have also either shrunk or disappeared (Prose 2017). President Donald Trump has additionally encouraged the elimination of arts and humanities programs (Deb 2017). The situation seems no better in the United Kingdom; according to articles by journalist Marina Warner in the *London Review of Books*, universities are skeptical of maintaining humanities departments due to an evident lack of funding (Warner 2014). In contrast, it is worth noting that a still small, but growing interest has been given to “liberal arts” and/or general education programs around the globe (Godwin and Altbach 2016). A solid debate on the education of the 21st century citizen and the insecure job market makes it clear that the traditional specialized curriculum is no longer feasible. However, such programs are still a minority in the world, and largely concentrated in the elite sector of higher education.

In Brazil, however, humanities and social science departments are generally protected, given the need to train administrative and educational personnel, and the ongoing expansion of higher education. It is also true that research universities are public and tuition-free. Brazilian public universities do not depend on donations and their leadership is chosen from among their faculty, often with the community’s consultation. In other words, administrators are not external managers on high wages, able to impose outside decisions founded on business arguments. On the contrary, administrators in Brazilian post-secondary institutions are usually committed to the institution of origin and have a fixed mandate, after which they return to their position as a faculty member. Brazil’s best universities are often autonomous, not only with respect to

academic priorities, but also in terms of budget management and internal investment priorities. This occurs at deliberative assemblies, where there is representation across all schools and institutions, in addition to staff members and students, and in which humanities have proportional representation, voice and vote.

That does not mean, however, that the status of humanities and social science departments in Brazil is safe from criticism and elimination. Given Brazil’s current unstable political status, social network fascists are continuously crying out against public resources being spent on activities and programs related to arts and culture. Mainstream media is not acting very differently, undermining anyone who still resists neoliberalism. Given this context, courses in the humanities are especially criticized and under attack, either directly or indirectly; from the shallow accusation that they are a nest for “communists” to the assertion that they consume public resources.

Given Brazil’s current unstable political status, social network fascists are continuously crying out against public resources being spent on activities and programs related to arts and culture

Brazil remains a peripheral country, whereby basic public education continues to be precarious, literacy is not exactly ubiquitous, social inequality is rampant, and post-secondary institutions are still developing (one of the first comprehensive universities, the University of São Paulo, dates from 1934). Brazil is a country in which investments in higher education have been significant for several decades, where research universities operate in an autonomous manner, and where graduate education with the public’s support has grown over the last five decades. Thus, we believe that a reflection on what has been occurring in Brazil in recent decades can help to identify similar points that are contributing to the crisis of the humanities in other countries.

This paper, furthermore, does not fully portray the role of the humanities and social science in institutions the world over. It is simply one opinion piece among others, in the hope that at least a part of what is discussed in this brief overview can stimulate reflection on the importance and place that the humanities hold in academic institutions.

What is measured when measuring academic production? What does one measure?

Both in the case of collective evaluation as well as individual assessment, the production and publication of peer reviewed literature for any given field and for any academic is considered paramount for research institutions. It is true that teaching and guidance activities also count for academic output, but the quality and quantity of publications are given special attention. It is worth noting that the importance of papers published in specialized journals ignores the major differences in the construction, dissemination, and rate of obsolescence of knowledge between a variety of subjects.

Let us consider, for example, that when a graduate of chemistry or biology defines their research project, the time period that the bibliography should cover is usually about five years. If something relevant was revealed regarding the specific theme before this period, it is almost certain that it was incorporated into the subsequent bibliography. As the progress of knowledge is swift, obsolescence is equally rapid, even though its pace is different in every field of knowledge. Hence, the most reasonable criticism for the choice of a single parameter such as the so-called "impact factor" as indicative of the quality of an article is that which states that every subject has a different maturation period, and that two years is a very brief one in most areas. In fact, even five years seems to be a rather narrow window. With this in mind, the area of humanities is distinct: while about 60% of articles published in indexed physics journals receive citations in the first five years after publication, only 2% of the articles of arts and humanities are mentioned in that period (Strel, 2005). This may indicate that most arts and humanities articles are of no interest to other researchers, which is a point that should not be disqualified a priori. Nevertheless, it may also mean that the half-life of articles in these areas is vastly greater than that of the articles in fields where changes occur at a quicker rate.

It is also necessary to consider that academic articles that have significant impacts on the area of humanities are not always cited from their publication in a journal. The most frequent case occurs when they are from a book, from which they were subsequently assembled

with other articles and essays by the author. On the other hand, the humanities are so diverse that some of the most well-known and influential texts have been published in places that would not be considered if one were to follow the evaluation methodology in the areas of the hard and natural sciences. These media include newspapers and books of a didactic nature or cultural dissemination, for example.

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Concerning the form of knowledge construction, the humanities are also very different. It is important to highlight the very long half-life of books that have created paradigms that have been referenced more than 50 years after their publication. It is clear that there are disputes regarding different currents of thought and viewpoints in various areas of university life. In the humanities, however, knowledge and its progress are ostensibly linked to ideological assumptions and affiliations to interpretative paradigms. It is therefore possible for a researcher to write a serious article on a topic without having to systematically confer, disprove, or confirm the conclusions of another article, written by a colleague from a very diverse starting point, with another ideological perspective. Interestingly, studies of scientific activity from an ethnographic viewpoint have been able to show that written scientific language plays a central, constructive role in the constitution of scientific facts and findings (see Atkinson 1996). With this in mind, however, it is clear that the simple transposition of the criteria of analysis of publications in natural sciences to the humanities is not only inadequate but also innocuous, in terms of the assessment of the real impact of the published texts.

In fact, it is not only the half-life of some texts that are long, but also the period of maturation of reflection. Considering competing discourses and opinions in the literature along with the possibility that the objects of study are susceptible to contrary approaches and interpretations (or even antagonistic ones), what characterizes a good text is not its conclusion, but rather the argumentation process, the line of reasoning to justify the choice of a given object, along with the discussion of a hypotheses. For this reason, the most prominent form of presenta-

tion tends not to be a brief article, but a monograph, in which the critical acclaim is reviewed and arguments are linked in order to compose a verisimilar framework that seeks hegemony. However, in order to deal with the pressure demands for more production, the result has been the publication of partial results in specialized journals. In areas such as literature or philosophy, for example, publications are not always consistent. The broken down publication of “results” leads to misunderstanding, full of harmful consequences.

To switch subject, we can now reflect on another specificity of the humanities: the way it is taught and the work done in the classroom. It seems evident that in many areas of the humanities there is no object identified *a priori* that can be “transmitted.” Unlike a class on calculus or a specific concept of chemistry, there are usually no objective contents that are unanimously recognized as such, and they can be taught with greater or lesser pedagogical efficacy from a consensual perspective.

In fact, a humanities teacher must teach a certain way of thinking, unless he or she wishes to simply teach facts. The importance of pedagogy includes engaging in counter arguments that occur through dialogue between teachers and students. This is particularly true when a teacher presents a cultural debate, its history, and the various interpretations surrounding a subject. The very choice of the “objects” in a class on humanities already implies dialogue between the past and the present, between the reading of yesterday and today. In Brazil, *one can observe an effort to import to the humanities the forms of evaluation used in intellectual production in the hard sciences, especially when evaluating papers in specialized journals.* This not only produces an incorrect assessment of merit, but has also been promoting a rapid change in the *modus operandi* of the humanities, with unknown consequences. This transformation has been so pronounced – and, in some environments, so deep – that the considerations and definitions we have made can be viewed as nostalgic discourses about a moment in the past, which is sadly condemned to come to an end.

The importance of pedagogy includes engaging in counter arguments that occur through dialogue between teachers and students

Teacher or researcher?

There is fairly widespread consensus that a faculty member should be a good researcher. However, it is not usually assumed that a good researcher should also be a good teacher. The prominence of research results is also evident in the evaluation of universities as well as in the selection of new faculty, and, in turn, in the progress in their respective careers. A direct consequence of the excessive weight of research indicators is that at the most respected universities, the figure of the teacher pales in comparison to that of the researcher. Classroom activity, for example, has increasingly become a necessary burden, a kind of toll to pay in return for access to the more decisive activity: research. Generally speaking, the teaching of undergraduate courses is not valued at all; these positions are often given to post-docs or teaching assistants. On graduate programs, the pressure to publish has also considerably reduced the time span available for the conclusion of graduate programs, with drastic consequences for projects that require deeper and more time-consuming exploration.

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It is worth mentioning that at many universities with flexible curriculums, the figure of the premature specialist is increasingly common. In fact, it is not difficult to find students who have spent their entire graduation focusing on a single theme, author, or aspect of a problem that is directly linked to their tutor’s research project. It is also increasingly common for such students to typically undertake graduate studies with the same tutor. This occurs without the acquisition of a repertoire of readings and meaningful references in their area of expertise, only allowing for the analysis of one specific field. It could almost be viewed as fatal that new doctoral students continue to concentrate their post-graduate studies around the very same topic or theme. In other words, the “researcher” profile is imposed over the “teacher” one and thus excessive specialization and vertical knowledge replaces an all-round education that can construct a way of thinking in the area of knowledge and its insertion in society. In this context, it is not surprising that the killer question, which is already openly formulated in other

countries, is being felt more and more in Brazil: Why should the state maintain the humanities? The mere possibility (albeit inconvenient and perhaps alarmist) of presenting such questions shows that we are living at a critical moment. So it is vital that we try to objectively map the state of affairs.

The strength of the excluded

We strongly believe it is necessary to develop proper fundamental indicators for selection, assessment, and impact of academic production. If it is true that there are things that are not objectively measured and perhaps should not be measured, it is also certain that the extent and appreciation of what is measured should in some way correspond to what is expected of a given area of knowledge.

Today, there are countless dissertations and theses, papers and articles, magazines and journals. We are living in a period when, according to an ironic and plausible estimate, a PhD thesis is read an average of 1.6 times⁽¹⁾, including the author himself/herself. It is imperative to identify what is important in each area of knowledge, so that committees, boards, rankings, and other assessment bodies can select what academic production to measure and how. Most of the efforts of people and institutions, given the strong competitive regime in which they act, tend to concentrate on what is worthwhile from an evaluative perspective. In addition, what is worthy from the point of view of evaluation is what goes on to be worthy in the area, leading everything that does not count into disuse, or into the background, which is unfortunately often the best a given area would have to offer. In other words, the attempt to standardize measurement criteria is a crude way of seeking universalization, because it produces a normalization of procedures for seeking knowledge that can alter the meaning of intellectual activity and subjects in the humanities.

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1. This number is given in Nature News, July 6, 2016: "The past, present and future of the PhD thesis". Available at: <https://www.nature.com/news/the-past-present-and-future-of-the-phd-thesis-1.20207>

In our point of view, one of the main problems of importing a techno-scientific paradigm is that it ends up excluding or minimizing what we could call the educational nature in a broad sense. Not the explanatory nature of manuals or computer programs geared to teaching, but education aimed at preparation and social performance: from classrooms to large physical and virtual auditoriums. What is excluded from the objective merit, in the shallow productivist evaluation, are not only unpublished activities on paper, which determine and are indeed often the main vehicle for consolidating relevant research, but also the various forms of non-academic exercises of the intellectual in society.

In the so-called hard and natural sciences, the dominant researcher profile is that of the specialist, which favors vertical examination of specific subjects and/or techniques, with a discourse addressed mostly at peers. In this framework, individuals who try to cross disciplinary boundaries in search of interdisciplinary research, synthesis, or formulations of a general nature are often viewed as infringers. A similar situation occurs with researchers who venture into the field of science popularization for the general public, which is considered a non-prestigious activity.

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When it comes to the humanities, the importation of the evaluative paradigms of STEMs (science, technology, engineering and mathematics) produced the corollary of undervaluation of activities that are not immediately identifiable as research. The problems with this paradigm shift include a lack of innovation and dedication to classroom activities. Other activities that would apparently be part of a full intellectual life, such as publishing in mainstream media or participating in conferences and debates for broad audiences, began to decline in importance, and be deprecated by activities directed at specialists (whose form, by default, is papers in specialized journals). Consequently, what has been observed is a progressive concealment, a growing absence of intellectuals linked to universities with respect to debates.

One may believe that this trend is due to a lack of interest on behalf of the public. Quite the opposite. In Brazil, a few examples of cultural activities have attracted a wide and diverse audience. This can be confirmed by

the media and bibliographic success of some individuals who have managed to break the glass ceiling, as well as the profusion of blogs, podcasts, Facebook groups, electronic magazines, YouTube channels, Instagram pages, and websites that currently discuss literature, philosophy, history, and other humanities subjects.

One important consequence of a lasting emphasis on specialization, allied with a touch of arrogance, is intellectual writing being profoundly marked as inter-peer discourse, even when the reader is part of a non-university audience. It is rather common, even in magazines and newspaper supplements, to come across texts that reflect the scars of academic discourse directed at a specialized audience, with formal language and syntax, and usually excessive use of fashionable jargon. The maintenance of specialized discourse is not just about a choice of audience. It is also exclusion. Not only of a non-university audience, but also the self-exclusion of the intellectual from the broader debate.

Another aspect to consider is the increasingly widespread presence of non-mediated electronic forms of communication. At a time when diplomacy is guided by a president's tweets, where a blog post by a renowned economist can have serious consequences for the economy of an entire country, and where free publications are shaping the perception of millions of people who have no access to specialized publications, to ignore or not value the participation of human scientists in the digital world is to concede that the humanities will never be able to have any public presence by means of articles in journals and other specialized publications.

The tools to measure the presence and impact of online publications are still being developed. There are initiatives such as altmetrics (<https://www.altmetric.com/>) and Google Scholar (<http://scholar.google.com>) that are widening the number of parameters to consider the impact of a publication. In fact, the whole area of scientific publishing is undergoing major transformation, with leading publishing houses trying to adapt to the pressure for open access and to an increasing number of alternative publications. In the case of the humanities, it is clear that the free circulation of texts without the peer reviewing procedure has drastically changed the approach to production and debate in the area. New tools have also been developed to study publication patterns in different countries (Kulczycki et al 2018).

In fact, we believe that, regarding the issue of academic merit, it is important to consider how the binomials of

training/information and teaching/research are articulated in each area, considering that they are neither antagonistic nor precisely complementary. The second term in each of these binomials has been systematically privileged. One must consider, bearing in mind the history of Brazilian universities, that the humanities have grown in size and importance because of their educational capacity, which has happened by means of teaching and public debate.

At the same time, we should consider the way that new information is rare in literature, philosophy or history and that interpretation, the attribution of meaning, and re-reading are privileged domains of progress. It is also worth considering that, if it is true that the result of a research study in physics, chemistry or in medicine – say a paper of Congress or a roundtable communication – may eventually find readers outside of its circle of experts, it is not certain that this is the practice. Nor should it be common in such disciplines for research in progress in the laboratory to be the subject of an initial bachelor's degree project or to be presented to the broader public. Yet, this is a common practice in the domain of the humanities.

So what we want to say is that one cannot only blame the administration of universities, the countercultural policy of governments, or the utilitarian vision of teaching for the so-called crisis of the humanities. There is no getting around the fact that a considerable part of this is its own responsibility. The danger occurs when, in the pursuit of valorization and respectability, humanities subjects choose to embrace the excellence of other areas of knowledge, but rather than administering a remedy or palliative method, they are instead swallowing a slow-affecting poison.

It does not seem easy at present to revert the loss of centrality in the study of the humanities as they present themselves and are articulated today, and as multiplied in relatively stagnant schools (and departments) and mostly centered on research. Mainly because this emphasis on research does not correspond -with the exception of some world-class universities- to effective achievements that justify them. We strongly believe that there are still ways to heal the wound, prevent the course that already seems to have been marked out, and recover a place of some relevance in university structure, as well as greater social representation.

Considering the moment that Brazil, and the world, is going through, we cannot see any other alternative

within the public, research-intensive university system, other than the difficult quest for a combination of efforts to prevent the various activities in the area from eventually limiting their activities to merely teaching disciplines on courses focused on the training of market professionals. As far as we can see, a path can be paved by eliminating excessive departmentalization, as well as fragmentation in schools, and developing trans-disciplinary spaces in which educational and outreach activities can occupy a central position. That is, to state it clearly: a space in which research would, in a certain way, be dependent on teaching and learning, and not the opposite. Nevertheless, a caveat is needed here: to value this kind of teaching, the crux of the matter is solid intellectual training in the field of professional activity.

Similar ideas have been discussed for many years. In his classic book "The Idea of the University" (Jaspers 1959), Karl Jaspers indicates the strong connection between teaching and research activities in humanities, as well as the differences and similarities between humanities and natural sciences. Jaspers is explicit in stating that "an educational ideal in which humanism and ... the natural sciences are joined ... for their mutual enlightenment has not been realized." He contrasts the liberal arts and natural sciences by saying that the subject matter of the former has more educational value than its methods of inquiry and interpretation. On the contrary, the methods of analysis and explanation used in the natural sciences have more educational value than their subject matter (Fincher 2000).

Evidently, such a reversal of perspective would not be easy to implement and might never happen. This is mainly because of the internalization of paradigms regarding what constitutes merit, impact and the subsequent feeling of decrease compared to other areas due to the withdrawal of the emphasis on research. It is clear, however, that this would be an illusion that we must fight against, since the emphasis on the educational role does not absolutely mean the end of specialized research. Such research must necessarily be intrinsically connected with other activities, mainly teaching and effective participation in society. In other words, university professors must reclaim their roles as genuine teachers.

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However, in order to pursue this goal, it is imperative that universities and governmental support agencies keep developing specific assessments of the academic production in each area of knowledge. When one allows only one evaluation methodology for such diverse areas of knowledge, it is clear that the same metric does not apply to all. The consequent corollary is starting to believe that everything that cannot be measured by means of such a metric lacks quality or relevance. This situation, for the future of culture and humanistic knowledge, appears to be a fatal error.

References

- Atkinson, Dwight. (1996). The "Philosophical Transactions of the Royal Society of London," 1675-1975: A Sociohistorical Discourse Analysis, *Language in Society*, 25:3, September, pp. 333-371 Published by: Cambridge University Press. URL: <http://www.jstor.org/stable/4168717>
- Dean, Alex. (2015). Japan's humanities chop sends shivers down academic spines. *The Guardian*, Sept. 26th. Retrieved from: <https://www.theguardian.com/higher-education-network/2015/sep/25/japans-humanities-chop-sends-shivers-down-academic-spines>; accessed in 25/4/2018.
- Deb, Sopan. (2017). Trump proposes eliminating the Arts and Humanities Endowments. *The New York Times*, March 15th. Retrieved from: <https://www.nytimes.com/2017/03/15/arts/nea-neh-endowments-trump.html>; accessed in 25/4/2018.
- Fincher, Cameron. (2000). Recalling Karl Jaspers' Classic: The idea of the University, IHE perspectives, Georgia: Institute of Higher Education, University of Georgia. Retrieved from: <http://www.uga.edu/ihe/pubs.htm/>.
- Godwin, K.A. and P.G. Altbach. (2016). A historical and global perspective on liberal arts education: What was, what is, and what will be. *International Journal of Chinese Education*, 5(1), pp.5-22.
- Jaspers, Karl. (1959). *The Idea of the University*. Boston: Beacon Press.
- Kulczycki, E., Engels, T.C.E., Pölönen, J. et al. (2018). Publication patterns in the social sciences and humanities: evidence from eight European countries, *Scientometrics*, 1: 116, pp. 463-486.

Prose, Francine. (2017). Humanities teach students to think. Where would we be without them? The Guardian, May 12th. Retrieved from: <https://www.theguardian.com/commentisfree/2017/may/12/humanities-students-budget-cuts-university-suny>; accessed in 25/4/2018.

Strel, Letícia. (2015). O fator de impacto do ISI e a avaliação da produção científica: aspectos conceituais e metodológicos, *Ciência da informação*, 34:1, Retrieved from: <http://revista.ibict.br/ciinf/article/view/1098/1214>.

Warner, Marina. (2014). Diary, London Review of Books, 36:17, September 11th. Retrieved from: <https://www.lrb.co.uk/v36/n17/marina-warner/diary> accessed in 25/4/2018.

16. How can we identify, evaluate and communicate the social impact of research? What is the key to successfully achieving the greatest social impact of research? Is the social impact of research a consequence of research or the very reason for its existence? Should research always seek social change and impact?

Research Impact Assessment as a Source of New Inquiries, Values and Practices in University Research Ecosystems

Paula Adam

Abstract

Since the mid-1990s, research impact assessment (RIA) has been used in many different ways: academic and regulatory approaches are probably the most well-known in the higher education universe, the former partly due to the scientific publications of Buxton and Hanney since 1996 and the latter partly due to the widely discussed universities assessment framework REF2014 in the UK. There is much less attention paid to the multitude of questions that RIA can help to put forward about the whys and the hows of science and universities. In this essay I will attempt to discuss some of the fundamental questions that RIA has encouraged practitioners to put forward in relation to science and society, the implicit social contract, the value of science to society and vice-versa, and in particular, whether and why science needs to change to bring more value. Questions like whether ‘competitiveness’ (rather than ‘cooperation’) is an attribute than brings more value to society will be addressed.

Introduction

‘Research impact assessment’ (RIA) is typically seen as a discipline and a (sum of) method(s) or protocols to measure retrospectively how science contributes to changes beyond universities, research centres and academic ecosystems. RIA is labelled a ‘discipline’ due to early academic-based studies and the background on retrospective observation, just like other scientific perspectives. In this article, I am arguing that RIA has gradually evolved prospectively towards new visions, values and practices and a shift towards a more proactive co-responsible approach towards impact.

‘Research impact assessment’ (RIA) is typically seen as a discipline and a (sum of) method(s) or protocols to measure retrospectively how science contributes to changes beyond universities, research centres and academic ecosystems

The first methodologically sound attempts at RIA were carried out back in the late 1990s and early 2000s. Most efforts were put into providing a sound academic background using robust methods and replicable results according to all scientific standards. RIA has since evolved into an anti-discipline, and a real-life everyday practice. Let us go by parts.

In the late 1990s, some of the earliest published academic RIA studies were authored by Martin Buxton and Steven Hanney from Brunel University, UK. They produced a theoretical model, the Payback Framework (Buxton and Hanney 1996), which was widely used by different scientific disciplines (especially biomedicine), countries and contexts. During the early 2000s and 2010s other studies appeared either using the Payback or other frameworks (Milat et al. 2015; Guhtrie et al. 2013; Greenhalgh et al. 2016; Banzi et al. 2011). The underlying goal of this generation of studies was to understand how science works (hence the development of theoretical frameworks and the focus on testing them). Theoretical frameworks started to proliferate hand in hand with the growing interest in understanding how science works in different contexts. For example, the Canadian Academy of Health Sciences developed (Frank & Nason 2009) an adaptation of the linear Payback Framework for domestic use in the Canadian context, which has evolved over time into a non-linear framework (Graham et al. 2012). In other parts of the world, the debate about understanding science focused on the assessment of enablers and facilitators of impact rather than assessing impact itself, arguing that impact was the long-term effect of today’s planning and actions. The so-called ‘Productive Interactions’ framework (Spaapen and van Drooge (2011) was applied at the European programme level⁽¹⁾ and later

1. The SIAMPI project was created to assess the research of the 7th European Framework Programme <http://www.siampi.eu/>

on at a country level in the Netherlands⁽²⁾. The endeavour of understanding scientific programmes, university research ecosystems and organisations spread to other countries (Guthrie et al. 2016; Solans-Domenech et al. 2013) either using fit-for-purpose models or applying available models in the literature. In present days, this analytical approach is still energetically alive, in part due to the huge methodological challenges that a scientifically based RIA exercise embeds and in part due to the continuous opportunities arising from new methods and available tools. To name a couple from the current global digital era, learning machine techniques and data mining tools offer a rich array of experiments for meta-scientists.

Analysing and understanding science has therefore been an important leitmotiv of RIA *workers*. However, there are others that are less academic but no less rigorous: advocacy (based on the need to demonstrate the societal contribution of science), accountability (based on the need to demonstrate responsible use of scientific resources) and allocation (based on the will to allocate according to demonstrated societal contributions). Most of these purposes draw from the learning and understanding gained from the analytical exercises published in scientific journals.

There is certainly an underlying discipline-approach to RIA, which has gained its respect in the scientific ecosystem and among scientific policy-makers. One example is the growing demand for demonstrable impact in the assessment processes of European programmes. When I argue that RIA is also a practice (some experts even call it an anti-discipline!), I refer to the fact that it also has (and has had) a behavioural effect on stakeholders. First, by raising new questions about the whole purpose of science. Second, by critically revisiting the underlying values of scientific enterprise. Third, by doing things differently. Let us go by parts.

RIA exercises are (or should be) like any scientific inquiry or evaluative exercise: a source for enlightening knowledge as much as shedding light on new inquiries. So, by doing RIA, practitioners are empowered with a better understanding of science, and hence they need to understand further, just like any policy-maker that

uses evidence. Consequently, impact-oriented practitioners today are more critical, and are adopting new values and new practices not envisaged 10 years ago. In what follows I present examples of the type of questions that the exercise of RIA has implicitly or explicitly promoted over the last 20 years.

Questions about meeting scientific missions, visions and objectives

One first generation of questions revolved around *the need to demonstrate the societal impact of science to society*. These inquiries came in democratic liberal societies hand in hand with the need to be accountable for public investment (in the case of government) and accountable to donors and philanthropists (in the case of non-profit foundations), but also the need to advocate for substantial and sustained research funding. That investing in science means investing in the future, which is something that any scientist would buy. But, what about Prime Ministers, or Boards of Trustees that need to legitimate their decisions by visualising the returns in the relative short term? There was a time in Canada and the United Kingdom when an evidence-based response to this question was necessary. The Canadian government decided in 2009 that investment in biomedical research should not be a totally free ticket: 70% of public investment in biomedical research needed to demonstrate its returns to the Canadian Parliament. Therefore, the Parliament commissioned to the Canadian Academy of Health Sciences (CAHS) the creation of an RIA instrument with a conceptual framework and a set of indicators (Frank and Nason 2009) to be collected annually. From a completely different RIA approach, an influential RIA study influenced the UK government's decision not to cut the public research budget in the years of austerity. This RIA study calculated monetarised economic return estimates (short-term and long-term) of the UK's cancer research (Buxton et al. 2008). The RIA team used novel economic evaluation methodologies applied to science impact (with assumptions and caveats considered in the calculations) in a very costly project that provided useful results both in the UK and globally. A few years later, similar studies of cardiovascular disease (CVD) research (Glover et al. 2014; Sussex et al. 2016) and musculoskeletal disorder (MSD) research (Glover et al. 2018) obtained similar

2. Standard Evaluation Protocol 2015-21 (SEP) describes the methods used to assess research conducted at Dutch universities and NWO and Academy institutes every six years, as well as the aims of such assessments <https://www.knaw.nl/nl/actueel/publicaties/standard-evaluation-protocol-2015-2021>

results. In summary (Grant and Buxton 2018): the health gain estimates (internal rate of return) for cancer, CVD and MSD are 10%, 9% and 7% respectively and the elapsed time from research investment to health gain is 15, 17 and 16 years. This was calculated for an average annual R+D investment (public and philanthropic) from the mid-70s to the end of 90s taking of £266 Million, £111 Million and £70 Million respectively and only the percentage of attribution to UK research was considered. These estimates represent an illumination of realistic health impact figures. In other scientific areas, a complementary approach based on accounting and econometric techniques was applied in France (Butault et al. 2015) and Catalonia (Guesmi and Gil 2017) to annual data over the 1959-2012 and 1985-2015 periods respectively to fit the relationship between agricultural total factor productivity (TFP) and agriculture research spending. The estimated social rate of return in these cases was 27-28% in France and 15-28% in Catalonia. Reaching these estimates was costly and time-consuming, especially for the case of the monetarised internal rate of health return where the challenge of time lag and attribution is particularly complex for the methodology to take into consideration. The estimates are especially useful for once again framing new questions in relation to the original question. Now that the impact of health science for specific diseases has been reasonably estimated, what next? Can we plan and organise science according to reasonable impacts?

Questions around how we can best organise scientific processes to optimise impact

A second generation of questions revolved around *the need to understand how science works in order to plan and organise according to societal impact*. RIA has also promoted scientific inquiry into effective planning. The implicit inquiry has been whether to follow a *laissez-faire* approach (i.e. letting science advance driven by curiosity) or to follow specific drivers. The reality is that even in an unplanned context, science has not always been driven by the curiosity of scientists but rather by market opportunities (e.g. pharmaceutical industries), prestige (e.g. prize schemes) or professional promotion drivers (e.g. university career schemes). What RIA has helped to

introduce to the scientific agenda is research planning oriented at societal drivers (e.g. health, sustainability, environment, etc.). In this context, RIA analysis provided an understanding of impact enablers and facilitators that research planners might benefit from considering. What are the enablers of impact? People, ideas, resources or collaborations? The RIA literature reached a consensus (Wooding et al. 2004; 2011; 2013; Guthrie et al. 2016; Solans-Domenech et al. 2013) that the essential factor for impactful research is people's attitudes, values, authenticity, leadership and engagement. Other factors are important facilitators: organisational strategies, funding, networks and support. These findings were the underlying evidence in support for the European Commission's so-called 'Responsible Research' and the importance of including engagement (and not only public engagement), and expanding it to the culture of the actual researcher, to professional decision-makers and the inclusivity of gender and diversity. Impact-driven inquiries have led to questions as to whether research planning should be organised around achieving scientific results, or rather around the achievement of societal (or planetary) missions. The Mazzucato report (2008) proposes a 10th European Framework Programme organised and assessed around grand missions. The success of sub-projects and work packages will be mutually dependent because they will share a single mission. This might have a huge influence on how research is assessed in the European Union, and might cascade into the assessment systems of universities, centres and national research funding programmes.

The reality is that even in an unplanned context, science has not always been driven by the curiosity of scientists but rather by market opportunities (e.g. pharmaceutical industries), prestige (e.g. prize schemes) or professional promotion drivers (e.g. university career schemes). What RIA has helped to introduce to the scientific agenda is research planning oriented at societal drivers (e.g. health, sustainability, environment, etc.)

Questions around the value of research, research waste and the reproducibility crisis

A third generation of new inquiries is more introspective and addresses the value of research in itself. Is all published research of value to science? Is there a stock of research that might be considered waste for not adding any value to science? The same question applies to 'value for money'. The Lancet series on 'Increasing value, reducing waste' (Macleod et al. 2014) was the stepping stone towards answering such clear-cut questions, although value for money had already been raised as an issue in a number of accountability-based RIA exercises. The Lancet series presents an enchainment of questions around the concept of research waste, mostly in scientific terms (but not only): Are the research questions adding any value? Are the studies incrementally adding new knowledge? Are the research questions relevant? Are the studies duplicating earlier efforts? Are the methodologies sound enough to provide replicable and robust results? Are results available for use by other researchers? Is the quality of the exposition of scientific results in the articles sufficient to make them properly usable by other researchers? Within this generation of inquiries there is also the literature raising concerns on the so-called 'reproducibility crisis' (Munafò et al. 2017) and the so-called 'research bubble crisis' (Jones and Wildson 2018). The reproducibility crisis pays critical attention to how published research that, if reproduced, would not yield the same results, recommendations or conclusions; this is, of course, another sort of waste. Solutions to force the interruption of malpractices are not straightforward, because incentives are also multifaceted (Pons and Adam 2018). Some strategies to reduce malpractices are research integrity codes of practice (in research centres), open access policy for published articles (and journals); open access policy for the original data of research studies; and the need to use systematic reviews to understand and demonstrate the state of the art before receiving funding. The values underlying these practices are integrity, transparency, societal value and value for money.

Responses to these questions in the university ecosystem: values and practices

In the previous sections, I have described how RIA has tried to give evidence to basic questions regarding the value of science in society. I have also described how RIA inquiries have partially contributed to reinforcing values and practices. Although it has been argued that these are new values and practices, this is not totally so and there have always been individuals who have been sensitive to societal transformation. For example, *Francis Bacon wrote in 1620: "there is another powerful and great cause of the little advancement of the sciences, which is this: it is impossible to advance properly in the course when the goal is not properly fixed. But the real and legitimate goal of the sciences is the endowment of human life with new interventions and reaches"*⁽³⁾. While societal transformation was not a goal of universities in itself, nowadays it is hard to find a university that does not include in its mission statements the gold standard of understanding, transforming and improving society and the planet. The key to transformative research (i.e. research oriented towards societal and planetary impact) is the researchers' engagement, culture, values, leadership and motivation. RIA has given long-standing evidence on this. However, are these new values and practices? Are we sure university researchers have not behaved according to these, despite the assessment system not rewarding it? Our experiences of cross-cut research impact assessment across all disciplines in a university ecosystem shows that there is a body of researchers in all disciplines, no matter which, that has been working to disseminate, transfer, change and transform. The most emblematic evidence came from the experience of assessing the public universities of the UK with the Research Excellence Framework in 2014 (REF 2014)⁽⁴⁾. The outcomes of this evaluative exercise are publicly available online, with almost 7,000 case studies of research that had a verifiable impact across all disciplines)⁽⁵⁾. These cases occurred before REF 2014. An expert analysis shows a

3. in *Novum Organum*, 1620

4. Research Excellence Framework 2014: <https://www.ref.ac.uk/2014/>

5. "Impact case studies" del REF 2014: <https://impact.ref.ac.uk/casestudies/>

hugely rich array of impacts⁽⁶⁾. Therefore, motivated researchers, and the aforesaid values and practices, were already there before REF2014, in spite of traditional assessment systems for promotions and rankings. This suggests that the re-orientation of assessment systems to balance excellence and impact/ missions might turn out to be an opportunity for many to empower values and practices, rather than a threat.

The key to transformative research (i.e. research oriented towards societal and planetary impact) is the researchers' engagement, culture, values, leadership and motivation

There are a number of European universities moving towards a shared impact agenda. The SEP in the Netherlands⁽⁷⁾ is an example, and the League of European Research Universities (LERU) uses the 'productive interactions' approach to promote, reinforce and assess the interactions that produce value to society (Van den Akker and Spaapen 2017).. As stated earlier, the engagement of researchers with key stakeholders, organisations, systems and society is a key factor for impactful research, with the support of research organisations and infrastructures.

Guidelines for an effective process of research impact assessment in universities

Assessing research impact is therefore a timely empowerment exercise for universities, and more importantly, an opportunity to proactively understand and give value to invisible transformative practices and support or even engage in researchers' impact pathways. In addition, a transformative RIA exercise can be useful to revisit the assessment system of universities based on scientific production, regardless of its value. In what follows, I describe 10-point guidelines for an effective RIA exercise useful for decision-making in university planning and

cultural organisational changes. Experts and practitioners from The International School on Research Impact Assessment (ISRIA) produced these guidelines from the learning and knowledge acquired after running five editions of 4.5 day courses around the globe (see Figure 1) and engaging with more than 500 research policy-makers, university practitioners and funders. The authors of the ISRIA statement (Adam, Ovseiko, Grant, Graham et al. 2018) defend a set of core values (Figure 2) that frame the contents of the ISRIA materials⁽⁸⁾ and shape the structure and values of the 10-point guidelines. For the purpose of this article, it is worth highlighting the importance for the authors of any RIA exercise bringing value for transformation. In these guidelines (see Figure 3), the authors explicitly state that any RIA study is unlikely to be effective if the implementation context is not well analysed and understood and the purpose (the use of the RIA results) continuously revisited. In addition, it is recommended that the stakeholders' needs (users of the RIA results) should be well understood, and stakeholders (users of the RIA results) should be engaged early with the RIA process. These are the first 4 points and none of them is typically 'academic' or methodological. Points 5 to 7 relate to the use of frameworks, methods, tools, data and indicators and state that the use of theoretical frameworks is only recommended if useful for the earlier points 1 to 4 and for making the next steps easier (selection of methods, data sources, indicators and metrics). Therefore, the framework should not determine the RIA process but the other way around. The recommendation is to choose the framework that best fits the stakeholder and your need (Guthrie, Warmae, Diepeveen, Wooding and Grant 2013). The experience and the complexity of any RIA exercise makes it necessary to ensure that your RIA is not limited to the use of one available method or data source. In other words, triangulation of methods and data sources is necessary to avoid poor and biased results, important blind-points and thus dangerous misinterpretation (Morgan, Grant et al. 2013). The same occurs with the use of indicators and metrics. Indicators should not talk alone, but should be aligned in comprehensive sets of indicators (frameworks can help), contextualised and mission-oriented (Wilson, Allen, Belfiore, Campbell, Curry, Hill et al. 2015). Ethics and conflicts of interests are also important to consider in an RIA process. Equally important is the communication of the

6. The nature, scale and beneficiaries of research impact: An initial analysis of Research Excellence Framework (REF) 2014 impact case studies. Research report 2015/01. King's College London and Digital Science. March 2015

7. Standard Evaluation Protocol 2015-21 (SEP) describes the methods used to assess research conducted at Dutch universities and NWO and Academy institutes every six years, as well as the aims of such assessments <https://www.knaw.nl/nl/actueel/publicaties/standard-evaluation-protocol-2015-2021>

8. The learning and teaching materials of ISRIA are registered in Creative Commons and are publicly available for free with no need for permission to use them for commercial purposes. in www.theinternationalschoolonria.com

RIA results to stakeholders. Of course, having engaged them early in the process will make communication easier, but one should still consider tailoring the messages according to each stakeholder's role, motivation, influence and decision-making capacity. The reason is that this will ultimately ensure that university community practitioners will take up the RIA results. If communication of RIA results is effective, the RIA study can lead to decision-making and actions on different fronts. What changes might occur in implementation of an RIA study? Possible changes may relate with how universities support researchers in engaging the public in their research, or in

communicating their results. Changes can also occur in the way departments or research groups are organised in order to achieve 'productive interactions', or in how the processes of defining research questions are set and supported from the university. Other changes can take place in the assessment system (balancing the weight of excellence and impact), or even in the culture and values of researchers themselves. Finally, simply because RIA is not a simple or one-size-fits-all exercise, it is recommended that results, experience and learning should be shared with other practitioners living similar experiences, perhaps through RIA communities of practice or networks. Also, promote discussion groups within your university in order to progress together. As stated earlier in this article, it is most likely that your RIA process and implementation will lead to new questions and plenty of room for discussion within the university ecosystem.

Figure 1. ISRIA courses

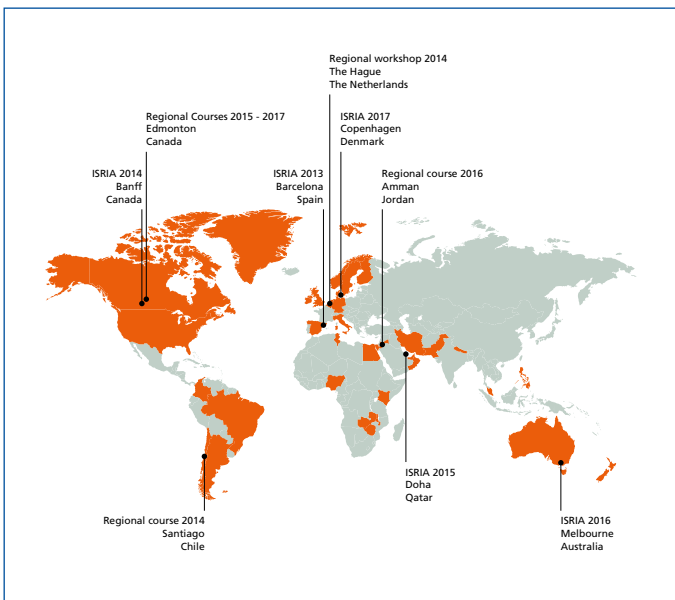
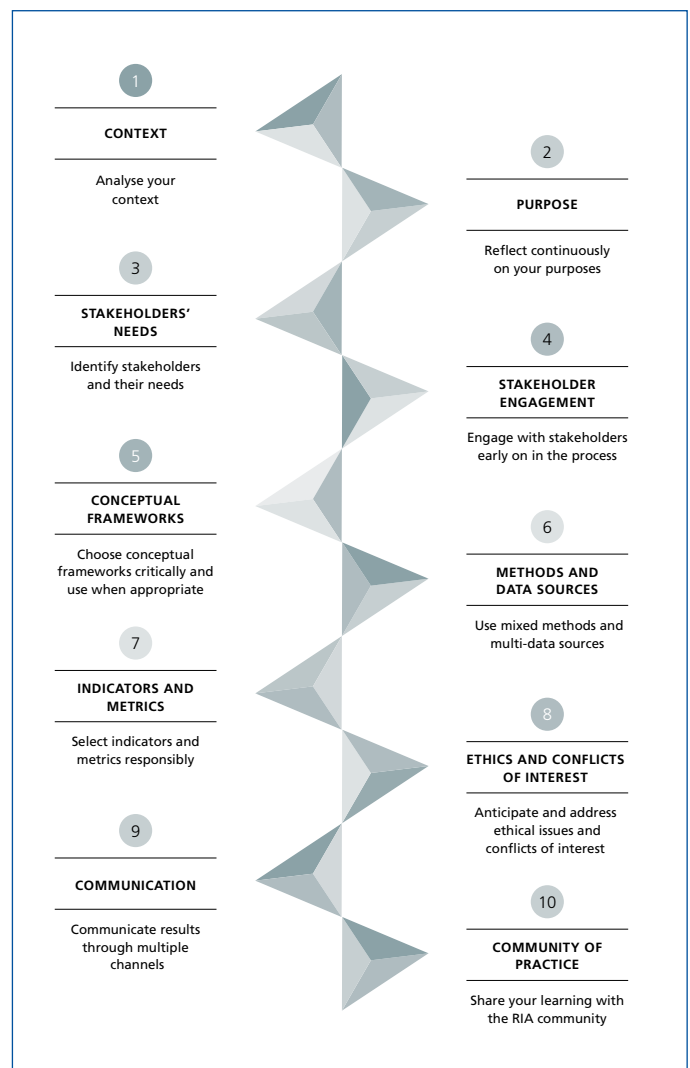


Figure 2. Core values



Figure 3. Guidelines



Simply because RIA is not a simple or one-size-fits-all exercise, it is recommended that results, experience and learning should be shared with other practitioners living similar experiences, perhaps through RIA communities of practice or networks

Final remarks

This article began by introducing the loop between carrying out a retrospective RIA study and acting prospectively. The argument is that no RIA study can be isolated from the real world and the needs of stakeholders and practitioners. The context is complex, stakeholders are many and have different motivations and interests, RIA needs a multi-faceted approach with mixed-methods and multi-data sources, and the process is unique in the sense that needs are applied to needs. An RIA exercise sheds light on the university research processes and organisational ecosystems. If effectively done with the stakeholders, with clear, revisited and contextualised purposes, and tailored communication, RIA results will lead to engagement and transformative action. Therefore, RIA might well become a rich source for new inquiries, values and practices in university research ecosystems for the sake of better universities that are more focused on our societies and planetary wellbeing.

References

- Adam, P., Ovseiko, P., Grant, J., Graham, K. et al. (2018). ISRIA Statement: ten-point guidelines for an effective process of research impact assessment. *Health Research Policy and Systems*, 16:8, doi: 10.1186/s12961-018-0281-5
- Banzi, R., Moja, L., Pistotti, V., Facchini, A. and Liberati, A. (2011). Conceptual frameworks and empirical approaches used to assess the impact of health research: an overview of reviews. *Health Res Policy Syst* 9, 26. doi: 10.1186/1478-4505-9-26
- Butault, J.P., Lemarié, S., Musolesi, A., Huard, F., Simioni, M. and Schmitt, B. (2015). L'impact de la recherche agronomiques sur la productivité agricole française: Une approche par le taux de rentabilité interne (TRI) des dépenses publiques affectées à la recherche agronomique en France'. *INRA Sciences Sociales* 1/2015, doi: 10.22004/ag.econ.210178
- Buxton, M. and Hanney, S. (1996). How can payback from Health services research be assessed?. *Journal of Health Services Research & Policy*, 1(1) pp. 35-43.
- Buxton, M. et al. (2008). Medical Research: What's It Worth?: Estimating the Economic Benefits from Medical Research in the UK. UK. London: UK Evaluation Forum. Available at: <https://mrc.ukri.org/publications/browse/medical-research-whats-it-worth/>
- Frank, C. and Nason, E. (2009). Health research: measuring the social, health and economic benefits. *CMAJ* 180(5), pp. 528-534. doi: 10.1503/cmaj.090016
- Glover, M., Buxton, M., Guthrie, S., Hanney, S., Pollitt, A. and Grant, J. (2014). Estimating the returns to UK publicly funded cancer-related research in terms of the net value of improved health outcomes. *BMC Med.* 12:99, doi: 10.1186/1741-7015-12-99
- Glover, M. et al. (2018). Estimating the returns to United Kingdom publicly funded musculoskeletal disease research in terms of net value of improved health outcomes. *Health Res Policy & Systems*. 16:1, doi:10.1186/s12961-017-0276-7
- Graham, K.E.R., Chorzempa, H.L., Valentine, P.A. and Magnan, J. (2012). Evaluating health research impact: Development and implementation of the Alberta innovates – Health Solutions Impact Framework. *Research Evaluation*, 21(5), pp. 354-367.
- Grant, J. and Buxton, M.J. (2018). Economic returns to Medical Research funding. *BMJ Open* 2018:8. Available at: <https://bmjopen.bmj.com/content/bmjopen/8/9/e022131.full.pdf>
- Greenhalgh, T., Raftery, J., Hanney, S. and Glover, M. (2016). Research impact: a narrative review. *BMC Med* 14, 78. doi:10.1186/s12916-016-0620-8
- Guesmi, B. & Gil, J.M. (2017). Measuring the impact of agricultural research on Catalan agricultural productivity. European Association of Agricultural Economists (EAAE) > 2017 International Congress, August 28-September 1, 2017, Parma, Italy, doi: 10.22004/ag.econ.261279
- Guthrie, Susan, Wamae, W., Diepeveen, S. Wooding, St. And Grant, J. (2013). *Measuring research: A guide to research evaluation frameworks and tools*. Santa Monica, CA: RAND Corporation. Available at: <https://www.rand.org/pubs/monographs/MG1217.html>.

- Guthrie, S., Kirtley, A., Garrod, B., Pollitt, A., Grant, J. and Wooding, S. (2016). A “Decisive” Approach to Research Funding: Lessons from three Retro6sight Studies. *Rand Health Q*, 6(1) p. 6. Available at: https://www.rand.org/pubs/research_reports/RR1132.html
- Jones, R and Wildson, J. (2018). The biomedical bubble. Why UK Research and Innovation needs a greater diversity of priorities, policies, places and people. NESTA. <https://www.nesta.org.uk/report/biomedical-bubble/>
- Macleod, M.R., Michie, S., Roberts, I., Dirnagl, U., Chalmers, I., Ioannidis, J.P., et al (2014). Biomedical research: increasing value, reducing waste. *Lancet*, 383:101-428, doi: 10.1016/S0140-6736(13)62329-6
- Mazzucato, M. (2018). Mission-oriented Research & innovation in the European Union. A problem-solving approach to fuel innovation-led growth. Brussels: European Commission: Available at: https://ec.europa.eu/info/sites/info/files/mazzucato_report_2018.pdf
- Milat, A.J., Bauman, A.E. and Redman, S. (2015). A narrative review of research impact assessment models and methods. *Health Res Policy Sys* 13, 18. doi:10.1186/s12961-015-0003-1
- Morgan Jones, M., Grant, J. et al. (2013). Making the grade: methodologies for assessing and evidencing Research impact. In: Dean, A., Wykes, M., Stevens, H. (eds). *Seven Essays on Impact. DESCRIBE project report for JISC*. Exeter: University of Exeter, pp. 25-43.
- Munafò, M.R., Nosek, B.A., Bishop, D.V.M., Button, K.S., Chambers, C.D., Percie du Sert, N., et al. (2017). A Manifesto for reproducible science. *Nature Human Behaviour*, 1 pp. 0-21, doi: 10.1038/s41562-016-0021
- Pons, J.M.V and Adam, P. (2018), La investigación biomédica en la encrucijada y vías de salida. *Medicina Clínica* 151 (3), doi: 10.1016/j.medcli.2017.12.013
- Smith, R. (2001). Measuring the social impact of research: Difficult but necessary. *BMJ*. 2001 Sep 8; 323(7312): 52827, doi: 10.1136/bmj.323.7312.528
- Solans-Domenech, M., Adam, P., Guillamon, G., Permanyer-Miralda, G., Pongs, J.M.V. and Escarrabill, J. (2013). Impact of clinical and health services research projects on decision-making: a qualitative case study. *Health Res Policy Syst*, 11(15), doi: 10.1186/1478-4505-11-15.
- Spaapen, J. and van Drooge, L. (2011). Introducing “productive interactions” in social impact assessment. *Research Evaluation*, 20(3), pp. 211-218, doi: 10.3152/O9582021X12941371876
- Sussex, J., Feng, Y., Mestre-Ferrandiz, J., Pistollato, M., Hafner, M., Burridge, P., et al. (2016). Quantifying the economic impact of government and charity funding of medical Research on private Research and development funding in the United Kingdom. *BMC Med*. 14:32, doi: 10.1186/s12916-016-0564-z
- Van den Akker, W. and Spaapen, J. (2017). Productive interactions: societal impact of academic research in the knowledge society. LERU position paper. Available at: <https://www.leru.org/publications/productive-interactions-societal-impact-of-academic-research-in-the-knowledge-society>
- Wooding, S., Hanney, S., Buxton, M. and Grant, J. (2004). The Returns from Arthritis Research Volume 1: Approach, Analysis and Recommendations. Santa Monica, CA: RAND Corporation. Available at <https://www.rand.org/pubs/monographs/MG251.html>
- Wooding, S., Hanney, S., Buxton, M. and Grant, J. (2011). Project Retrosight. Understanding the Returns from Cardiovascular and Stroke Research: The Policy Report. *Rand Health Q* 1;1(1):16. Available at <https://www.ncbi.nlm.nih.gov/pubmed/28083172>
- Wooding, S., Pollitt, A., Castle-Clarke, S., Cochran, G., Diepeveen, S., Guthrie, S. et al. (2013). Mental Health Retrosight: Understanding the Returns from Research (Lessons from Schizophrenia): Policy Report. Santa Monica, CA: RAND Corporation. Available at https://www.rand.org/pubs/research_reports/RR325.html.
- Wildson, J., et al. (2015). *The Metric Tide: Report of the Independent Review of the Role of Metrics in Research Assessment and Management*. London: SAGE.

Cultural Impact of the Impact Agenda: Implications for Social Sciences and Humanities (SSH) Research

Gemma Derrick

Abstract

In the past, research has been assessed and valued primarily in relation to its academic contributions and only through the use of summative indicators (citations, collaborations, complex indicators) as well as subjective assessments of research “excellence”. However, globally, countries and research organisations are increasingly looking to institutionalise methods for gaining returns on their investments in science through formalised considerations of how research has made a contribution to society, beyond academia. These intentions include infiltrative, ex-post, definition-bounded, formal assessment criteria at the organisational level, such as the Impact criterion used in the UK’s Research Excellence Framework in 2014 and to be used in 2021; or the productive interaction, ex-ante approach used by many funding agencies such as the ERC, NSF and RCUK.

This chapter will explore classic and developing models of research impact generation and assessment, as well as new emerging debates about impact that are the result of realised impact assessment exercises such as the UK’s REF, the Netherlands Standard Evaluation protocol, the indicator system of Australia, as well as micro-level assessments at the research funding level. In addition, it will outline and compare efforts by countries and research organisations that have shown an intention to, but have still not formally implemented methods of research impact capture and assessment. Finally, it will compare these efforts on the macro- and meso-organisational levels to the micro-level effects on the production of knowledge and research culture. Specifically, it will address the question of if, and to what extent, research should have an implicit and explicit influence on society, as well as the moral component of incentivising impact without sufficient hindsight of the nature of the assessment object.

Introduction

Globally, the race to respond to increased public calls for transparency and accountability in the distribution of public funds has also had a resounding effect on the current state of play of research evaluation policies. In the past, research has been assessed and valued primarily in relation to its academic contributions only through the use of summative indicators (citations, collaborations, complex indicators) as well as subjective assessments of research “excellence”. More recently, the rise of the so-called “impact agenda” has resulted in many countries formalising a stream of evaluation that, in addition to monitoring and assessing the impact research has within academia, has also necessitated that researchers be aware and be able to articulate this effect ‘beyond academia’. As a result, countries and research organisations are institutionalising methods of returning on their investment in science through formalised assessments of how research has made a contribution to society. These intentions include infiltrative, ex-post, definition-bounded, formal assessment criteria at the organisational level, such as the Impact criterion used in the UK’s Research Excellence Framework in 2014 and to be used in 2021; and also the productive interaction, ex-ante approach used by many global funding agencies such as the ERC, NSF and RCUK. However, alongside this change in the way research is assessed as excellent, and therefore rewarded, comes the parallel change in how researchers behave during the production of knowledge. This is therefore expected to generate widespread changes in the research reward system, and there is a culture that is poised to disproportionately affect already vulnerable groups and research endeavours, namely SSH research.

This chapter will explore how global research policies have embraced models of research impact generation and assessment. This will include exploring new and emerging debates about impact that are the result of ongoing impact assessment exercises such as the UK’s

REF, the Netherlands Standard Evaluation protocol, the indicator system of Australia, as well as micro-level assessments at the research funding level. This chapter argues that alongside changing priorities in research policy and evaluation comes the risk of corresponding changes in the way knowledge is created; as well as the culture of research; and what, and who, is considered valuable and deserving of public investments. The monitoring of these changes is a topic that researchers are only now beginning to embrace. In particular, these cultural changes are a topic that is positioned to influence the most vulnerable within an increasingly competitive science system including Early Career Researchers (ECRs), women and the future of disciplines within the social sciences and humanities. Thus, this chapter provides a cautionary message for countries and research organisations that have shown an inclination towards, but have still not formally implemented, methods of research impact capture, and/or assessment.

The rise of the so-called “impact agenda” has resulted in many countries formalising a stream of evaluation that, in addition to monitoring and assessing the impact research has within academia, has also necessitated that researchers be aware and be able to articulate this effect ‘beyond academia’

The global impact agenda: new rules for accountability

The move to assess the impact of research ‘beyond academia’ has its roots in notions of research competitiveness, accountability and transparency (Olssen 2016), and the increasing need for audits to increase productivity, and also represent a shift towards greater managerialism of universities through research (Chubb and Watermeyer 2016). Through evaluation mechanics provided to ‘facilitate’ the impact assessment process (Derrick 2018) such as definitions of impact, key insights into the national-led priorities for the role of research as a contributor within society are revealed. These are shown through behaviours or gameplaying tactics that indirectly promote the importance of some types of impact over others.

The main example of the utilization of ex-post impact assessment is the UK’s 2014 (and subsequent 2021) Research Excellence Framework (REF2014/2021). The

REF in 2014 represented the world’s first formal, ex-post assessment of how research had had an impact beyond academia that was linked to the allocation of research funding. In its next iteration, the REF2021, Impact will rise from 20% (REF2014) to 25% alongside significant changes in how impact overlaps with other criteria, which effectively means that its contribution to the overall assessment of research quality is likely to be higher (Williams and Grant 2018). Without a doubt, the use of this criterion has positioned impact as a serious notion of academic excellence on the individual level and also as one that is of strategic and competitive importance on the organizational level. As a framework, the UK’s REF2014/2021 represents perhaps the world’s most developed agenda for evaluating the wider benefits of research and its success has influenced the way many other countries define and approach the assessment of impact. The UK’s research impact definition, currently defined as “an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia”, albeit not its assessment process, has been likened to being the ground zero of the global impact agenda (Watermeyer 2016), whereby the UK’s definition has been replicated or has contributed to the evolution of impact definitions in other countries (discussed below) as well as on other levels (actors) of the UK science system. This includes the way definitions used by the Research Councils UK (RCUK) have been formed for the assessment of ex-ante impact included as part of competitive grant decision-making⁽¹⁾. Even though the submission of a Pathways to Impact statement to demonstrate ex-ante impact is an essential requirement for all submissions, unlike REF ex-post impact, ex-ante impact represents an unformalised and unstructured assessment criteria and evaluation process. Nonetheless, the importance of non-academic impact to academia is now prominently placed with UK higher education and research policy, and therefore has had a remarkable influence on research culture (Marques, Powell et al. 2017).

Other countries have followed suit and moved to formally incorporate a broadly defined notion of societal excellence of research within either formalised eval-

1. The RCUK definition of impact is that “Economic and societal impact is the demonstrable contribution that excellence in social and economic research makes to society and the economy, and its benefits to individuals, organizations and/or nations” <https://www.ukri.org/innovation/excellence-with-impact/>

uations, or else informally acknowledge ex-post and ex-ante evaluations of research. In many cases the definition of societal excellence itself betrays governments' priorities regarding the wider societal expectations of research outputs (Watermeyer 2014, Watermeyer 2016), whereby the formalised consideration of impact within evaluation frameworks is a policy concept that is driven primarily by policy-makers and government notions of impact (Reale, Avramov et al. 2017) and favours, over more nuanced concepts of cultural impact, a view of research that drives innovation, competitiveness and economic development in the context of a knowledge based economy (Alastalo et al, 2014). In these situations, we see either an explicit reference to economic, or else industrial impacts, or else an implicit bias towards these types of impacts by the emphasis on notions of impact that are represented primarily through quantitative indicators (Wilsdon 2016). Although it is not the intention of this chapter to enter into the indicators for societal impact debate⁽²⁾, it has been suggested that the implicit political message given by an emphasis on the provision of some types of indicators to evidence societal impact betrays a prioritisation towards economic or industrial research outputs over the broader consideration of cultural or more salient societal impacts (Wilsdon 2016). The next section will briefly discuss and compare some of the existing societal impact definitions within national contexts.

Country-distinct differences to measuring impact

The adoption of societal impact measurements as part of a wider political commitment to accountability has been echoed in many other countries (Hill 2016). Since considerations of societal impact are increasingly tied to evaluation definitions provided by the nationally focused audit exercises, this section will concentrate on how these definitions imply a prioritisation of some forms of societal impact over others, leading to possible changes in research culture to be explored in the following section. It must also be stated that the objective of this section is not to draw any normative conclusion about each country's commitment to a par-

ticular form of impact over broader impacts. There are already a number of articles in the literature that adopt this stance⁽³⁾. Rather, here the differences are described with a view to drawing reasonable parallels between prioritisation of assessment criteria and frameworks towards a particular notion of societal impact, and changes in research culture in line with parallel changes in knowledge production mechanisms.

With regards to assessing ex-ante societal impact plans, similar to the UK's Research Council's mandatory 'Pathways to Impact' statements (described above), other countries and global funding organisations (namely the European Commission) require applicants to submit impact plans alongside fellowship and competitive grant applications. The Horizon 2020 Research and Innovation Programme explicitly focuses on social outcomes in its "Science with and for Society" section, as well as in other sections (Owen, Macnaghten et al. 2012). Similarly, in the U.S., the National Science Foundation's (NSF) new "Broader Impacts" criteria, i.e. criteria related to socio-economic impacts emerging from the National Science Board, the governing and advisory body for the NSF requires applicants to engage in broad, societal impact-driven planning alongside their more formal grant applications (Holbrook 2005, Holbrook and Frodeman 2007, Holbrook 2012). Here, the focus is on the term "broader impacts", as opposed to specifying a definition-driven inclusive conceptualisation of societal impact. As such, it is not possible to explore any implicit bias towards economic or other notions of societal impact. Such examination would be best conducted with a focus on evaluation processes and decision-making, rather than as an explicit, top-down direction regarding the prioritisation of one notion of societal impact over others. Indeed, according to a 2011 document (Holbrook 2005, Holbrook and Frodeman 2007, Holbrook 2012), research proposal review criteria should include an assessment of the overall quality of proposals that includes a consideration of scientific quality as it "contribute[s] more broadly to achieving societal goals." However, what is relevant is an NSB directive that "assessment and evaluation of NSF projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects." This preference for

2. For a full overview of the debate please see Bornmann, L. (2013). What is the societal impact of research and how can it be assessed? A literature survey. *Journal of the American Society of Information Science and Technology* 64(2), pp. 217-233

3. Please see Watermeyer, R. (2016). Impact in the REF: issues and obstacles. *Studies in Higher Education* 41(2), pp. 199-214.

quantitative measures suggests, but does not confirm, a process-level bias towards societal impacts that can be 'counted'.

In the Netherlands, the NWO uses a definition-driven approach for ex-ante impact assessment that still, within its definition, encompasses all notions of societal impact; "what relevance to, impact on or added value for society the research unit's work has (had) or is being (has been) demonstrated at regional, national or international level during the assessment period and, where applicable, continuing into the near future." A similar inclusivity is implied in Italy's "third mission activities"⁽⁴⁾, however as with the NSF's "broader impacts" criterion, the promotion of a set of indicators to guide its evaluation (Bonaccorsi 2018, Di Berardino and Corsi 2018) implicitly favours notions of societal impact that can be counted, e.g. technology transfer, spin-off companies, patent activity, etc.

In contrast, ex-post evaluation definitions are more finite and, like with ex-ante assessment of impact, can use definitions that appear open and inclusive to all notions of societal impact, but a provision of indicators to aid in the evaluation process results in an evaluation-practice that heavily favours economic, and countable impact over more salient, and nuanced notions of cultural or political impact. In The Netherlands, the Standard Evaluation Protocol (SEP), currently hailed in research evaluation circles as the hallmark of societal impact assessment (Jong 2015), uses the definition;

"The contribution made by scientific research, in both the short and long term, to changes in, or the development of, sectors of society and to challenges facing society. Such sectors of society include the economy, culture, public administration, and healthcare while the challenges include such issues as climate change, immigration, quality of life, the environment, the rule of law, and security."

As with the majority of impact definitions, the above Dutch definition emphasises societal impact as making a positive contribution to specific sectors benefitting society. In addition, the characterisation of impact occurring through responsible interactions

with social sectors (otherwise referred to as normal impact (Derrick, Faria et al. 2018)), embeds the notion of valuable co-productive relationships with relevant stakeholders and societal actors as essential towards achieving societal impact. It must also be stated that unlike the UK context, the Dutch evaluation is not linked to the allocation of research funding. This distinction was a deliberate policy decision so as not to create undesirable incentives to maximise the value of indicators of impact through societal-impact gameplaying (Gunn and Mintrom 2016).

In the Finnish context, an integrated definition that balances the importance of scientific and societal impact equally, rather than specifying a unique definition for impact beyond academia; "based on a peer review of scientific quality, but factors related to science policy may also influence the decisions. Examples of such factors are the promotion of equal opportunities for both genders, the advancement of junior researchers' careers, as well as the economic, environmental, societal and technological impacts of research" (REF). In contrast, in the Australian perspective, societal impact evaluation is driven by a similarly broad definition to the one used in the UK; "...the contribution that research makes to the economy, society, environment or culture, beyond the contribution to academic research." The first formalised Engagement and Impact Assessment (EIA) [exercise] took place in 2018 (Nicholson and Howard 2018). Its aims were to assess, using the above definition, how well researchers are engaging with end-users of research and demonstrate how universities are translating their research into economic, social, environmental, cultural and other impacts (Nicholson and Howard 2018). Like Finland, the societal impact assessment process alludes to the inseparability of scientific and societal impact by running the EIA parallel to the Excellence in Research Australia (ERA), which concentrates primarily on the traditional notions of scientific excellence: within rather than beyond academia.

In all country contexts described above, parallel to notions of implicit political prioritisation of research evaluation processes in relation to societal impact, there is the argument that what measures "good" impact has overshadowed considerations of how we should measure it.

What is needed is a process-focused argument. The majority of critique of its societal impact assessment processes has focused on using insights from peer

4. Third mission activities are defined as the openness of the university towards the socio-economic context through the valorisation and transfer of knowledge. Bonaccorsi, A. E. (2018). *The Evaluation of Research in Social Sciences and Humanities: Lessons from the Italian Experience*, Springer.

review processes (Holbrook and Hrotic 2013, Derrick 2018). In many, if not most, nationally-driven, agenda-based assessments of societal impact peer review approaches have been used to evaluate social impacts of research, typically with little or no modification from approaches used to assess scientific quality (Derrick and Samuel 2016, Derrick and Samuel 2017, Derrick 2018, Derrick 2018). As such, the majority of studies that utilise a process-focused critique of societal impact assessment concentrate on examining the suitability of using traditional, expert-driven, self-governance processes such as peer review to assess notions of excellence that extend beyond academia and therefore beyond the remit of these peers or experts (Derrick 2018). When responsibility for the assessment of societal impact, as well as the responsibility for its generation and production, lies with the academic community, alongside its governance mechanisms, cultural changes in the organisation, prioritisation and management of research are to be expected.

Impact and the change in research culture

The re-orientation of priorities of research outcomes from an emphasis of outcomes that have value inside, to those that have value 'beyond academia' has also resulted in rhetoric that holds academia accountable for its scientific achievements. These changes are already having a profound effect on academic practice and culture (Chubb and Watermeyer 2016).

Since changes to the way the scientific impact of research is valued alters academic behaviour (Glaser, Laudel et al. 2002, Weingart 2005, De Rijcke, Wouters et al. 2016), then it logically follows that re-orientation towards valuing non-academic outputs would also witness a corresponding change in research behaviour and the way in which knowledge is produced. Although empirical studies of this change have yet to yield any firm results, there are already indications of how an emphasis on impact beyond academia as a pervasive and/or formalised norm of research excellence has re-orientated the way contributions from research areas, or individual researchers, are valued, and therefore how knowledge is produced and research performed. This is especially felt by already academically vulnerable groups on such individual levels as gender and race; and are revitalising claims of neglect being paid to sub-

jects within the SSH spectrum⁵. This section explores how changes in the emphasis of non-academic impact results in a parallel change in the production of knowledge. Also, by expanding the consideration of research excellence, it explores how studies have indicated a change in attitudes or behaviour towards the generation of excellent research that results in greater returns for the researcher, research area or discipline. Engaging in this behaviour comes with increased risks for already vulnerable groups in academia, including women, migrants and ECRs and this has the potential to generate further inequalities within the academic sphere. This section will also reflect on how this increased global concern for non-academic achievements may affect the next generation of SSH academics.

A change of emphasis from excellence of research to include impact and including these criteria in formalised evaluation frameworks linked to funding allocation also influences the culture of academia (De Rijcke, Wouters et al. 2016). This change is claimed to be problematic for universities and scientists, and is what Bozeman et al (2013) refer to as the 'dark side' of societal impact (Bozeman, Fay et al. 2013). This goes beyond the result of simple gameplaying, and instead refers to how the formalisation of societal impact as a necessary criterion within the research reward system unconsciously side-lines and creates barriers for equality, or else exaggerates existing inequalities within the science system (Savigny 2019). Savigny has already discussed how the re-orientation of research reward structures around engagement, and impact beyond academia, especially through media and social media engagement poses significance risks for women. For her, an emphasis on the necessity to engage in impact also needs to involve a parallel politics of ethics to protect women and other vulnerable groups from the risks associated with unstructured research engagement; and "invites us to reflect on what and how wider social and political power structures may be reinforced, rather than challenged by public engagement and in the Impact agenda" (p14). These risks are increased by the media, as well as trolling through social media engagement.

Likewise, for Early Career researchers (ECRS), the pressure to conform to competitive notions necessary for career progression and advancement are said to dest-

5. For more information regarding the concept of an SSH spectrum, please refer to the upcoming piece by Derrick and Ross- Hellueaur (in progress) *Decolonising the social sciences and humanities through peer review*.

abilise academics' notions of professional identity (Balaban and Benneworth 2019). ECRs are not necessarily skilled in the complexity of achieving impact and do not necessarily directly receive the socialisation through impact-engaged mentors required to navigate the complex pathways to societal impact, while also balancing a highly insecure career stage (Balaban and Benneworth 2019, Fenby-Hulse, Heywood et al. 2019). For the ECRs, during the process of fulfilling institutional expectations, they are given cause to abandon or deviate from 'traditional' or honoured codes of conduct and/or ideological maxims that underpin, inform and guide who they are and what they do (Balaban and Benneworth 2019). In this sense, there are risks and trade-offs associated with engagement and impact that are unique to ECRs. In the current political orientation of research policy towards impact, these tensions and inequalities are poised to be acutely felt on individual and research culture levels. In countries that have a commitment to, but have yet to formulate, evaluation processes, or else clear definitions of research impact 'beyond academia', its absence only emphasises the competing definitions existing in different arenas within the academic environment (de Jong and Muhonen 2018). This is then compounded by the lack of precedent and community understanding about what is "good" impact (Derrick 2018) and serves to increase uncertainties regarding the expectations academics face in achieving impact criteria set as performance goals. In these situations, as discussed by Chubb & Watermeyer, 2017, researchers being complicit within the evaluation system in which they exist and the way they orientate their behaviours, as well as the production of knowledge, is an unintended consequence that research has thus far failed to address completely. As more countries move to formally incorporate a commitment to greater research accountability through impact beyond academia, as well as either implicitly or otherwise adopting indicators or processes that favour particular notions of societal impact over others, parallel changes in research culture will be experienced by existing vulnerable groups. Future research should take note of this cautionary tale and focus on providing discussions, mechanisms and considerations that can limit the growth of inequalities within the science system as a result of the impact agenda.

Final remarks

As public calls for increased accountability⁽⁶⁾ of scientific investment grows, so too will the impetus that drives the assessment of research value 'beyond academia'. However, alongside this public-accountability come changes in research culture that establish new norms of excellence, for which a new generation of academics will be held accountable. Although culture change takes time, and paradigmatic changes on an individual level even longer, the speed at which research policy has adopted a formalised assessment of impact beyond academia and instigated a structural and organisational approach to achieving these excellence goals in receipt of public funds suggests that a cultural change in research towards broader notions of public accountability and demonstrating public value may be rapid. Whereas ordinarily, the incorporation of notions of accountability beyond academia is seen to be a positive move to formally acknowledge the public as a research-investor, on the disciplinary level, global changes in the assessment of research value beyond academia risk changes to the culture of how research is produced. Whereas for STEM this change may be welcomed, or considered an extension to business-as-usual that reflects the inbuilt altruism of many researchers or research endeavours (Garibay 2018), for disciplines not as inclined towards generating easily measurable indicators of societal impact, this change is set to have more disruptive cultural effects. These cultural effects are acutely felt in social science and humanities (SSH), as well as influencing the next generation of knowledge producers and further, on-going research is needed to map their proliferation and influence on existing vulnerable groups within the research community.

6. For an examination of the concept of 'competitive accountability' and its relationship to the evaluation and governance of societal impact in its broader sense, please refer to Watermeyer, R. and Chubb, J. (2018). Evaluating 'impact' in the UK's Research Excellence Framework (REF): liminality, looseness and new modalities of scholarly distinction. *Studies in Higher Education*, 44(9), pp. 1554-1566.

References

- Balaban, C. and P. Benneworth. (2019). "To unlock the impact of ECR research, create stable academic identities." LSE Impact Blog.
- Bonaccorsi, A. E. (2018). *The Evaluation of Research in Social Sciences and Humanities: Lessons from the Italian Experience*, Springer.
- Bornmann, L. (2013). What is the societal impact of research and how can it be assessed? A literature survey. *Journal of the American Society of Information Science and Technology* 64(2): pp. 217-233.
- Bozeman, B., D. Fay and C. Slade (2013). Research collaboration in universities and academic entrepreneurship: the state-of-the-art. *The Journal of Technology Transfer* 38(1): pp. 1-67.
- Chubb, J. and R. Watermeyer (2016). Artifice or integrity in the marketization of research impact? Investigating the moral economy of (pathways to) impact statements within research funding proposals in the UK and Australia. *Studies in Higher Education*: 1-13.
- de Jong, S. and R. Muhonen (2018). Who benefits from ex ante societal impact evaluation in the European funding arena? A cross-country comparison of societal impact capacity in the social sciences and humanities. *Research Evaluation* (rvy036).
- De Rijcke, S., P. F. Wouters, A. D. Rushforth, T. P. Franssen and B. Hammarfelt (2016). Evaluation practices and effects of indicator use—a literature review. *Research Evaluation* 25(2): 161-169.
- Derrick, G. E. (2018). *The Evaluators' Eye: Impact Assessment and Academic Peer Review*. London, UK, Palgrave Macmillan.
- Derrick, G. E. (2018). Take peer pressure out of peer review. *Nature* 554: 7.
- Derrick, G. E., G. Faria, P. Benneworth, D. Budtz-Petersen and G. Sivertsen (2018). *Towards characterising negative impact: Introducing Grimpect*. STI 2018 Conference Proceedings, Leiden, The Netherlands, Centre for Science and Technology Studies (CWTS).
- Derrick, G.E. and Samuel, G. (2017). The future of societal impact assessment using peer review: Pre-evaluation training, consensus building and inter-reviewer reliability. *Palgrave communications* 3, n.17040. Available at: <https://www.nature.com/articles/palcomms201740>
- Derrick, G. E. and Samuel, G. (2016). The Evaluation Scale: Exploring Decisions About Societal Impact in Peer Review Panels. *Minerva*, 54(1), pp. 75-97.
- Di Berardino, D. and Corsi, C. (2018). A quality evaluation approach to disclosing third mission activities and intellectual capital in Italian universities. *Journal of Intellectual Capital*, 19(1) pp. 178-201
- Fenby-Hulse, K., Heywood, E. and Walker, K. E. (2019). *Research Impact and the Early Career Researcher: Lived Experiences, New Perspectives*. Routledge.
- Garibay, J. C. (2018). Beyond traditional measures of STEM success: Long-term predictors of social agency and conducting research for social change. *Research in Higher Education*, 59(3), pp. 349-381.
- Glaser, J., G. Laudel, S. Hinze and L. Butler (2002). "Impact of evaluation-based funding on the production of scientific knowledge: What to worry about, and how to find out." Expertise for the German Ministry for Education and Research 31(2002).
- Gunn, A. and Mintrom, M. (2016). Higher education policy change in Europe: Academic research funding and the impact agenda. *European Education*, 48(4), pp. 241-257.
- Hill, S. (2016). Assessing (for) impact: future assessment of the societal impact of research. *Palgrave communications* 2 (16073).
- Holbrook, J. B. (2005). Assessing the science–society relation: The case of the US National Science Foundation's second merit review criterion. *Technology in society* 27(4): pp. 437-451.
- Holbrook, J. B. (2012). Re-assessing the science-society relation: The case of the US National Science Foundation's broader impacts merit review criterion (1997-2011). *Technology in Society* 27(4): pp. 437- 451.
- Holbrook, J. B. and R. Frodeman (2007). Answering NSF's Question: What are the "Broader Impacts" of the Proposed Activity. *Professional Ethics Report* 20(3): 1-3.
- Holbrook, J. B. and S. Hrotic (2013). Blue skies, impacts, and peer review. *A Journal on Research Policy & Evaluation*.
- Jong, S. d. (2015). Engaging scientists: organising valorisation in the Netherlands.

Marques, M., J. J. W. Powell, M. Zapp and G. Biesta (2017). How does research evaluation impact educational research? Exploring intended and unintended consequences of research assessment in the United Kingdom, 1986-2014. *European Educational Research Journal* 16(6): pp. 820-842.

Nicholson, J. and K. Howard (2018). A study of core competencies for supporting roles in engagement and impact assessment in Australia. *Journal of the Australian Library and Information Association* 67(2): pp. 131-146.

Olszen, M. (2016). Neoliberal competition in higher education today: Research, accountability and impact. *British Journal of Sociology of Education* 37(1): pp. 129-148

Owen, R., P. Macnaghten and J. Stilgoe (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and public policy* 39(6): pp. 751-760.

Reale, E., D. Avramov, K. Canhial, C. Donovan, R. Flecha, P. Holm, C. Larkin, B. Lepori, J. Mosoni-Fried, E. Oliver, E. Primeri, L. Puigvert, A. Scharnhorst, A. Schubert, M. Soler, S. Soòs, T. Sordé, C. Travis and R. Van Horik (2017). A review of literature on evaluating the scientific, social and political impact of social sciences and humanities research. *Research Evaluation* 27(4): pp. 298-308.

Savigny, H. (2019). The Violence of Impact: unpacking relations between gender, media and politics. *Political Studies Review*.

Watermeyer, R. (2014). Issues in the articulation of 'impact': the responses of UK academics to 'impact' as a new measure of research assessment. *Studies in Higher Education* 39(2): pp. 359-377.

Watermeyer, R. (2016). Impact in the REF: issues and obstacles. *Studies in Higher Education* 41(2): pp. 199-214.

Watermeyer, R. and J. Chubb (2018). Evaluating 'impact' in the UK's Research Excellence Framework (REF): liminality, looseness and new modalities of scholarly distinction. *Studies in Higher Education*: 1-13.

Weingart, P. (2005). Impact of bibliometrics upon the science system: Inadvertent consequences? *Scientometrics* 62(1): pp. 117-131.

Williams, K. and J. Grant (2018). A comparative view of how the policy and procedures to assess research impact evolved in Australia and the UK. *Research Evaluation* 27(2): pp. 93-105.

Wilsdon, J. (2016). *The Metric Tide: Independent Review of the Role of Metrics in Research Assessment and Management*, SAGE.

Part 7

Gender and Equality

17. How can equal gender opportunities in access to education and the choice and continuity of an academic and research career be encouraged today?

Are Women Their Own Obstacles to Progress – a Woman’s Perception!

Zakia Ali-Chand

Abstract

The underrepresentation of women as leaders in higher education institutions and other industries continues to be a major challenge as the 21st century enters its third decade. In Fiji, as with other developing Pacific island countries, women lecturers are not able to advance to assistant/associate/professor level at the same rate as that of their male counterparts. The careers of female academics stall at the lecturer or assistant lecturer level. Most of the available literature on the slow progress of women in achieving equal access to education and leadership positions has focused on social, physical and economic barriers. This paper will focus on the challenges faced by women lecturers for becoming academic leaders rather than leading academics and the difficulties they face in progressing from the rank of lecturer to that of professor. The paper will argue that a significant barrier faced by women who obtain higher research degrees and become active researchers is the lack of support and encouragement from other women professors within academic institutions. The report is based a survey of the perceptions of female faculty in Fiji. A workshop on gender and leadership for 30 participants, who are non-professoriate staff, was conducted in early March 2019 at the Fiji National University and data collected from this sample was analysed to ascertain whether women are obstacles to their own progress.

Introduction

The underrepresentation of women in senior positions at universities is a phenomenon not only in Pacific Island countries but one that is evident worldwide (Parker, Hewitt, Witheriff and Cooper 2018). Today, statistics from universities all over the world show that more females are enrolling for undergraduate and post-graduate degrees; but there is still imbalance in senior management positions. In higher education institutions in the UK it has been found that women account for 45% of academic staff, but only 22% of professors (Shepherd, 2017: p.82). Savigny (2014 cited in Shepherd, 2017, p.83) “calculates that at the current growth rate of 0.75 per cent per annum it will take over 100 years for women to achieve equal numbers in the UK professoriate.” A study conducted in 1993 on women in higher education management at the University of the South Pacific (USP), based in Fiji, found that only 27% of the academic staff were women (Thaman and Pillay, 1993, p.177). It must be noted that in 1993, the USP was the only university catering for some 15 island nations of the South Pacific. While there were no female heads of schools in 1993, by 2019, 23% of them were women (Khan, 2019). Over a period of a quarter of a century, there was an increase of less than 25% in female academics in middle management at the USP, now one of three universities in Fiji. Across 27 countries of the European Union, only 10% of the universities that award PhDs are headed by women (Shepherd, 2017, p.82), even though research shows that women can play a significant role in improving the performance of an organization.

This chapter aims to present the challenges faced by female academics for gaining promotion to senior ranks and management. It argues that one of the barriers to progress is women themselves. Though there is a paucity of research information on this factor, arguably an indicator of its lack of importance, there is clearly a dearth of women in the top level at higher education institutions all over the world.

Without doubt, gender parity in corporate organizations, governments, the private sector, non-governmental organizations, statutory bodies and academic institutions remains imbalanced at the end of the second decade of the 21st century. Barriers such as inadequate female role models, male-centric systems in the workplace, marginalization factors, the demands of motherhood and being a working parent, and other social, cultural and financial challenges still prevail in spite of the numerous discussions of these issues in women's forums over the last forty or so years. One of the major barriers to women's advancement continues to be the inability to strike a balance between work and family. Barriers such as unequal pay and sexual harassment are also now being reported more frequently. Even though many impediments have been addressed and efforts are being made today to reduce gender inequality in the workplace, there are subtle factors still at play. One of these, and which has been given very little attention but crops up in conversations in women's forums, is the lack of support and mentoring from women in higher ranks to other lower-ranked women.

Barriers such as inadequate female role models, male-centric systems in the workplace, marginalization factors, the demands of motherhood and being a working parent, and other social, cultural and financial challenges still prevail

As with most patriarchal societies, we find that women's access to education is limited and oftentimes priority in the pursuit of higher education is given to the male members of a family. At Fiji National University (FNU), the enrolment of female students for undergraduate medical programmes increased from 58% in 2014 to 75% in 2018 (FNU News, 2019); however in engineering and agricultural programmes the male:female enrolment ratio is still around 80:20 (FNU Annual Report, 2017). Women are overrepresented in humanities and education while grossly underrepresented in science, technology, agriculture and engineering. While women might be overrepresented in employment in education and humanities, they are still underrepresented in leadership roles. In universities around the world, only about 20% of Vice Chancellor positions are occupied by women (Shepherd, 2017, p.82). The Organization of Economic Cooperation and Development (OECD) stated in its report from a conference on "Improving women's access to leadership: What Works?" that it may take 81 years to achieve gender balance in corporate organizations (OECD, 2016, p.6).

Brief overview of the current situation

While evidence shows that enrolment of female students is increasing and more women are graduating from universities each year, the increase in the number of women in executive boardrooms is disproportionate (Credit Suisse, 2014, cited in OECD 2016, p.20). According to a ten-year survey of Fortune Global 200 companies, there has been a less than 1% increase in women on boards per year since 2004 (OECD 2016 p.20). New research by Mercer (ibid.) shows that women make up 41% of the overall workforce of organisations globally. However, the figure is much lower at the executive level, being 19% (ibid.). Research by Credit Suisse on FTSE 100 and S&P 500 companies finds that men in CEO positions outweigh women by 20 to one, and in the UK, men in executive management positions outnumber women 10 to one (ibid.). With increasing numbers of women in the workforce at all levels, they continue to be underrepresented in senior management positions with higher departure levels (ibid.). Nothing has really changed in the last forty years, and the barriers women face are oftentimes subtle, informal, hard to define, and mutually reinforcing.

Key challenges faced by female academics

There are barriers to women's career advancement at all levels: individual, organizational and societal. A barrier at one level reinforces a barrier at another. but they are most concrete at the organizational level (Wood, Franken and Plimmer, 2018). Factors such as a lack of mentors and line manager support mean that women may get overlooked when opportunities arise and are open to discriminatory treatment. Line managers often seem to know what is best for their workers and this leaves female staff even less empowered and lacking in confidence to aspire to senior positions.

We may be reaching the end of the second decade of the 21st century and the world has progressed much in information and communication technology, but societal attitudes towards women seem to be centuries behind. Women continue to be discouraged and often lack the motivation and confidence to move up the ranks and participate in decision making. Barriers to women's

progression to senior levels include sexism, stereotyping, unconscious bias and lack of support from other women in senior positions. The OECD (2016) reports that other barriers include patriarchal leadership structures, inflexible working hours and lack of leadership training programmes. Women are often perceived as lacking ambition or the skills required to serve in senior management roles. In the Pacific, women face certain gender issues that cut across all the island nations, including low levels of political participation, poor working conditions, and not being given the freedom to pursue higher research degrees without approval from their senior managers. Data from the European Union (OECD, 2016) reveal that women are also underrepresented in EU decision-making bodies at the local level.

In the Pacific, women face certain gender issues that cut across all the island nations, including low levels of political participation, poor working conditions, and not being given the freedom to pursue higher research degrees without approval from their senior managers

Other barriers reported in the OECD's findings (2016) include cultural, structural and self-imposed barriers. Key challenges facing women both globally and locally include lack of critical mass and role models, unconscious bias in all aspects of their careers and access to key networks. Discussions in local women's forums have also revealed that female leaders sometimes become obstacles to progress through their lack of support and mentoring for their female juniors. This may be due to the male dominant structures in organizations influencing women leaders to provide inadequate support in order to survive and move up the ranks. The challenge is far greater for married women who are often at the mercy of their husbands and only rise as high as is convenient for the latter. These challenges have been revealed time and again in all societies, whether they are developing or developed first world countries.

In March 2019, I conducted a survey with some female academics at Fiji National University to find out what obstacles they face regarding advancement to senior positions. When asked, 30% of them agreed that female supervisors in some way or other failed to provide the support and mentoring they needed for career progression. They were asked whether they ever felt that their co-workers, either male or female, had failed to support their career progression, and 30% replied that their

female colleagues provided more obstacles to progress than men. Answers ranged from female supervisors and colleagues being over-critical to supporting male colleagues over females. When asked what kind of mentoring and support they receive from their colleagues, again 30% responded that their male colleagues were often supportive and understanding. The research found that women saw each other more as competitors than collaborators, and the competition between them led women to strive to outshine each other. There was a general consensus that women are their own worst enemies when it comes to success in the workplace.

When asked if they were planning to apply for academic promotion, 30% of the respondents stated they were not because they were not confident that they fulfilled the academic requirements to do so. Some stated that they could take on new roles, but did not feel that they were ready for it. Such self-imposed barriers also contribute to the dearth of women leaders in senior management. Women often lack the confidence to apply for such positions, as a result of negatively assessing their own self-worth and limiting their aspirations of promotion.

When asked whether the proportion of women to men at work matters to them, 30% of the women stated that it does, and that they needed to see more female role models in senior positions. There is a greater need now more than ever to work towards that mental shift whereby women can achieve the same things that they see other women doing. Starmaski and Son Hing (2015, p.6) note that "Organizational members are likely to perceive that the climate for women is positive when women hold key positions in the organization. Specifically, the presence of women in key positions acts as a vivid symbol indicating that the organization supports gender diversity."

Then there are the gender stereotypes such as women being submissive, passive, timid, indecisive, security-oriented and therefore incapable of acquiring leadership positions. Although women want to move up the ranks, such stereotyping, which brings about a fear of failure in them, adds further constraints on seeking higher leadership positions.

At both local and global women's forums in February and March 2019, women continued to speak out against gender inequality and inequity. One of the key points coming out of these discussions is the notion that women lack confidence and that that is the cause of their lack of upward progression and participation in leadership

roles. Another important finding from these discussions is that male dominant structures are embedded in the policies and procedures of many organizations, which seem to favour the “old boys” network.

At a women’s forum that I attended in April 2019 in Penang, Malaysia, women came out strongly in support of the notion that women in senior management positions are often oblivious to the struggles and challenges faced by women within their organizations in their rise to the top. Views such as “women leaders are very different from their male counterparts” or “the approach women take is very different from that of men” were heard in a panel discussion involving both younger and older women. Another view that came out of this discussion was that oftentimes women impede the progress of other women if they had faced struggles of their own when rising to senior positions.

Women in senior management positions are often oblivious to the struggles and challenges faced by women within their organizations in their rise to the top

Discussions from women’s forums continue to highlight a lack of confidence to break the glass ceiling and make it to senior positions at the rate that men do. While it may be true to a certain extent that women are at a disadvantage in some areas, whether consciously or subconsciously, they also contribute to the lack of upward progress among other women. For example, when working mothers are unable to attend meetings or activities at their children’s schools, the criticism from other women is often so unrelenting that they can be labelled bad mothers. Conversations with women reveal that there is a lot of tearing down of each other rather than mutual support and motivation for whatever they are aspiring to achieve.

Although women may be portrayed as supportive of other women, in practice they can be quite the opposite. In the survey conducted at Fiji National University in March 2019, some female academics commented that women do not want to see other women doing better, perhaps due to a feeling of entitlement and or/competition. Some women commented that this may be due to the conditioning they have received since childhood, and their minds have not been reconditioned enough for them to be sincerely happy and supportive of other women’s advancement. They attribute this to competition, envy or certain personal issues in their own lives.

Another reason suggested by some women is that they do not support each other when their social structure is threatened.

According to Stamarski and Son Hing (2015), discrimination in the workplace contributes to women’s lower socio-economic status. Such discrimination may also emanate from the organizations’ Human Resources (HR) policies and decision-making processes. Shepherd (2017) notes that the individualistic nature of academic careers puts women under pressure to manage their own advancement. A study by Moss-Racusin, Dovidio, Brescoll, Graham and Handelsman on gender disparity among science faculty further confirms the argument that “both genders exhibit bias against female undergraduates” (2012, p.16477). The results revealed “that both male and female faculty judged a female student to be less competent and less worthy of being hired than an identical male student, and also offered her a smaller starting salary and less career mentoring” (ibid.). In a similar study by Steinpreis, Anders and Ritzke (1999, cited in Moss-Racusin et.al. 2012, p. 16477), it was found that “psychologists were more likely to hire a psychology faculty job applicant when the applicant’s curriculum vitae was assigned a male (rather than female) name.” Because of such factors as lack of confidence and motivation, women opt out of applying for academic promotions, while lack of support from other female academics also makes them wary of their own merits. Without endorsement from their fellow women colleagues they tend to “avoid” applying for senior roles in their institutions (Shepherd, 2017, p.84).

Because of such factors as lack of confidence and motivation, women opt out of applying for academic promotions, while lack of support from other female academics also makes them wary of their own merits

Higher education institutions the world over need to develop leadership programmes to foster the presence of women in senior management roles. Universities often seem to be grounded in the ideology of meritocracy, so specific women’s leadership programmes are not unanimously supported (van den Brink and Benschop 2012). They also seem to encourage women to pursue career progression the way men have been doing, without giving thought to women’s unique qualities and contributions (Lipton 2017).

Recommendations

Research shows that the lack of gender inequality in senior roles is a consequence of both external and internal factors. Any progress in breaking down these barriers requires an understanding of the complexity of factors surrounding women's access to top positions. All institutions need to focus on sound policies aimed at breaking down barriers and guaranteeing equal access. They need to bring about structural changes and provide more flexible hours of work, child-care centres and other support structures that will help to promote gender equality and equity through the shared efforts of everyone concerned.

All institutions need to bring about structural changes and provide more flexible hours of work, child-care centres and other support structures that will help to promote gender equality and equity through the shared efforts of everyone concerned

The OECD (2016) recommendations include merit-based approaches to senior positions, mainstreaming family-friendly work practices and gender-sensitive working conditions, promoting female role models, and getting men to actively encourage gender equality.

In higher education institutions, as with other private and public organizations, there is a need to ensure that structural efforts are made to promote an enabling environment and provide a gender diverse workforce. For example, senior management roles often require longer working hours, which can undermine the representation of women. Since we are in an era of advanced information and communication technologies (ICT), institutions can capitalise on these to enable flexible working schedules, while other measures, especially for women, including more flexible meeting hours, the use of video conference facilities, working from home and providing good child-care facilities at the workplace will help parents to maintain their work-life balance.

Institutions also need to support the development of women's leadership. Professional training and development programmes, mentoring and sponsorship, and international workshops and training for potential women leaders should be identified to encourage them to take up leadership roles. Women sometimes need to be pushed into senior roles and encouraged to overcome their self-inflicted barriers and feel more confident about their possibilities.

Furthermore, the achievement of gender parity requires culture change at the organizational level. Institutions need to review their policies and encourage the acceptance of more women in senior positions. Affirmative action such as reserved seats or quotas for women in senior management may bring about a more conscious effort to address gender parity issues.

Conclusion

Research thus far has shown that women not only encounter biased judgments of their competence among their male counterparts but also receive less encouragement to progress to senior management among fellow females. Women continue to demand greater equality and equity, along with professional training and development in the areas of negotiation, leadership, networking, and publishing and communication skills. There is a need to set up more networks to harness resources and form strategic alliances so that women can influence policy in their organizations in order to change the structures and practices that inhibit them from progressing upwards. Most importantly, female academics need the support of their fellow women colleagues, and to form networks that can provide the mentoring and sponsorship that they need in order to advance to senior management. Finally, to bring about greater gender equality and equity, higher education institutions need to set up specifically designed women-only career development programmes, which can be facilitated by women and focus on leadership to facilitate women's transition from being leading academics to academic leaders. Such programmes may create safe spaces for women to share their experiences without bias and dispel their notions of inadequacy, incompetency and deficiency.

References

- Braun, S., Stegmann, S., Hernandez Bark, A., Junker, N., & Van Dick, R. (2017). Think manager—think male, think follower—think female: Gender bias in implicit followership theories. *Journal of Applied Social Psychology*, 47(7), pp. 377-388.
- Fiji National University (2019). Females make up 75% of enrolments in CMNHS UG programmes, *FNU News*, 5 April, FNUPR: CMNHS, 562/2019.
- Fiji National University, (2017). *A Year of Transilience*, Annual Report [Online] Retrieved from https://www.fnu.ac.fj/new/images/FNU_Annual_Report_2017.pdf.
- Khan, N. (2019). Global and regional perspectives of challenges faced by women academics. Presentation at FNU Leadership Development for Women in Higher Education Workshop, 7 March.
- Lipton, B. (2017). Measures of success: Cruel optimism and the paradox of academic women's participation in Australian higher education. *Higher Education Research & Development*, 36, pp. 486–97.
- Moss-Racusina, C.A. Dovidio, J.F. Brescoll, V.L., Graham, M. J. and Handelsman, J. (2012). Science faculty's subtle gender biases favour male students. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 109(41), pp. 16474-16479.
- Thaman, K. and Pillay, S. (1993). *Women in Higher Education Management in the South Pacific: The case of The University of The South Pacific*. Paris: UNESCO.
- OECD, (2016). *Conference on improving women's access to leadership*, Background Report. 8 March Paris: OECD.
- Reilly, A., Jones, D., Rey Vasquez, C., & Krisjanous, J. (2016). Confronting gender inequality in a business school, *Higher Education Research & Development*, 35 (5) pp. 1025-1038.
- Shepherd, S. (2017). Why are there so few female leaders in higher education: A case of structure or agency? *Management in Education*. 31(2), pp. 82-87.
- Starmaski, C.S. and Son Hing, L.S. (2015). Gender inequalities at the workplace: the effects of organizational structures, processes, practices and decision makers' sexism, *Frontiers in Psychology*. 6:1400.
- Van den Brink, M. and Benschop, Y. (2012). Slaying the Seven-Headed Dragon: The Quest for Gender Change in Academia, *Gender, Work and Organization*. 19(1). pp. 71-92.
- Wood, K. Franken, E. and Plimmer, G. (2018). *Modern barriers to professional women's career advancement*. Victoria: University of Wellington.

Case Study — RMEI on TARGET- Taking a Reflexive Approach to Gender Equality for Institutional Transformation in Mare Nostrum

Anastasia Zabaniotou

The Mediterranean basin has been the cradle of important civilizations, is an exceptional eco-region, has unique natural and cultural heritage, and its inhabitants share the feeling of belonging to ‘the same sea’ (Mare Nostrum). At the crossroads of three continents, the Mediterranean Sea brings together countries at various levels of economic and social development, with different religions, languages and cultures, and all of which share a common civilization. The people of the Mediterranean region, at the crossroads between North and South, East and West, wish to embrace common values of equity among countries and generations, mutual respect, solidarity, and peace.

The Mediterranean Network of Engineering and Management Schools (RMEI) was created in June 1997 by initiative of the Ecole Supérieure d’Ingénieurs Group of Marseille (ESIM) and is supported by UNESCO (Chair 651 in Innovation and Sustainable Development). In 2010, a student network called the ‘Young Mediterranean Ambassadors’ group (GAME) was created. The RMEI currently includes 99 Higher Education Institutions from 17 Mediterranean countries.

Since its creation, the RMEI has highlighted the specific strengths of the Mediterranean, based on increased synergies through the networking of the Grandes Ecoles and Universities, and the unique potential of young people to make the shared dream come true of a better world in the Mediterranean and beyond. As the Mediterranean is currently facing major environmental, economic and social challenges, the RMEI is focused on equitable and sustainable development, including economic vitality based on a green economy, social cohesion, gender equality, environmental protection and the sustainable management of natural resources to meet the needs of the present generation without compromising the possibilities of future ones.

The RMEI’s mission is to foster responsible ethics among the Mediterranean youth through education and culture, in the knowledge that Universities play a key role in contributing to social transformation through Education, Research and Innovation. This role is fully reflected in the United Nations (UN) Sustainable Development Goals (SDGs). The member universities of the RMEI are committed to embedding these goals in the 2030 global agenda and conducting their activities within this framework. The huge cultural, socioeconomic and political disparities across the Mediterranean basin are of major relevance for developing effective lines of action to support real change, and the RMEI envisages that Engineering and Management students need to be aware of the challenges that the Mediterranean and the planet are facing and to take personal responsibility as future scientists, engineers and managers for acting towards social and environmental justice.

The RMEI recognizes that the half of the population, i.e. women, cannot be excluded from collective decision-making to tackle the global and local challenges that affect both women and men equally. The gender imbalance in Mediterranean countries is a consequence of many different social, cultural and religious factors and practices. Governments, funding agencies and higher education institutions have frequently neglected the issue of gender equality. In the academic and research world, women are still underrepresented, especially across specific subject areas and senior positions. Despite the remarkable gains that women have made in education and the workforce, and the gender balance that has been achieved among undergraduate students, this does not mean that gender equality has been achieved throughout academia, where women are globally underrepresented in senior academic positions and decision-making, which leads to the loss of a critical mass of talent, thoughts and ideas, and prevents countries from achieving their maximum development

potential. Striking gender inequalities persist in terms of career advancement and participation in decision-making. Higher Education Institutions and organizations have a unique role to play in developing a working environment that supports gender equality, particularly in career advancement, job quality and equal representation at the top levels. There is currently widespread inequality in the involvement of women in engineering compared to men, especially in advanced career levels. Although engineering is widely regarded as critical for national economies, most countries have not achieved gender equality.

Gender equality in engineering education is a key issue for the RMEI, which believes that female engineers need to be considered equal to men at all levels of their activities and life. Universities need to produce socially responsible graduates, and gender equality must be embedded in this worldview. Through its activities, workshops and events, the RMEI is looking to foster a shift towards gender equality among its members. Such a shift might be informal (changes in attitude, awareness) or formal (institutional change). With a view towards this transition, the RMEI has elected a gender-balanced managing board (50% women) and developed a Gender Equality Policy (GEP) that complies with its mission for Sustainable Development, in which male and female engineers, scientists and managers can play a major role. The RMEI has also issued a gender equality statement declaring that women need to be considered equal to men at all levels of their activities and lives and that the gender dimension in teaching, research and innovation in relation to the Sustainable Development Goals must be strengthened. The RMEI has also mobilized its members by developing a community of practice to foster a shift towards a more balanced value system at universities and in life, embracing cooperation and partnership instead of competition and domination, where women and men enjoy the same opportunities.

The RMEI gender equality strategy is being boosted by the Horizon 2020 TARGET project *'Taking A Reflexive Approach to Gender Equality for Institutional Transformation'*, in which the RMEI is one of ten partners. This project aims to promote gender equality in research and innovation (R&I) by supporting a reflexive gender equality policy. The TARGET countries have typically been viewed as relatively 'inactive' in developing gender equality policies in R&I. The widening gap between 'proactive' and 'inactive' countries could have

negative implications on the quality and excellence of R&I. The TARGET approach goes beyond the formal adoption of a gender equality policy by establishing a community of practice for gender equality and tailored Gender Equality Plans (GEP) that are designed, implemented, monitored, self-assessed and evaluated at each institution. Within TARGET, the path towards gender equality at universities is defined as a three-dimensional construct:

1. Addressing gender bias in human resource management (recruitment, retention and career progression of female researchers).
2. Addressing gender imbalances in decision-making processes.
3. Strengthening the gender dimension in R&I content and Higher Education curricula.

The RMEI has developed a Gender Equality Policy (GEP) in the framework of the SDGs and is calling for education strategies and related actions to pursue the SDGs. On 27 March 2019 in Rome, the RMEI member universities endorsed that Gender Equality Policy and agreed to work towards gender equality in their institutions.

Further information: <http://www.gendertarget.eu/>

Case Study — Gender Inequality in STEM in Spanish Higher Education

Andrea Fernández and Ana Sánchez-Bello

It is known that sex discrimination does not originate from the education system but from a social-historical construction of gender. We are aware that Higher Education is an integral part of society and not an isolated entity, and it is connected and forms part of the cultural and social system in which it is involved. So, HE institutions have only reflected what happens in our own society. Academic institutions gather the strengths and weaknesses that coexist in society, which reflects a different perspective from that which recognizes HE as an institution based on neutrality and objectivity, according to which people (mainly professors) are impervious in their work to everything that occurs outside of its own walls.

It is widely recognized that HE is not only built on the grounds of objective and set knowledge, but rather that these are mirrored in the social values and ideology that are presented through hidden curricula. Gender discrimination is one of the factors that condition the lives of individuals in terms of identification as a woman or man on the basis of stereotypes that discriminate against females. Accordingly, in the Spanish HE system, just like in other countries, there are still careers viewed as “male” or “female”, with women still being poorly represented in STEM. According to the latest facts and figures on education in Spain (MECD, 2016) in the 2014-2015 academic year, 53.9% of girls decided to pursue humanities and social science at high school as opposed to 44.5% of boys. In contrast, 50.8% of boys enrolled for scientific and technological high school subjects whereas only 38.9% of girls decided to make a similar decision. Through an analysis of university degree programs in the 2016/2017 academic year, it becomes clear that a greater number of women pursue architecture and biology, whereas the average number of women in engineering studies and physics were only 28.2% and 25.3% (MECD, 2018). Furthermore, rather than increase, female enrolment in technological studies has actually dropped in recent years, with

the Instituto de la Mujer showing that the percentage of women pursuing IT in 2012 was 14.91% whereas nowadays is 11.9%, three percentage point less than about six years ago.

A study to determine the motivations to enrol- or not- for an IT engineering bachelor’s degree was conducted with a sample of 20 first-year female university students who decided to pursue -or not- IT engineering. Data collection was carried through an analysis of statistics provided by the MECD (2018) and 20 semi-structured interviews.

The interviewed women stated that their main reasons for enrolling in IT engineering were the communication possibilities offered by ICT’s: *“I was considering studying something related to criminological sciences but there weren’t any bachelor’s degrees so in the end I decided to take this. Why? Because it allows me to talk to people from all over the world”*. Other motives are the interest in “hard” scientific subjects like maths and physics at secondary school and IT being prospectively perceived as the driving force of the future: *“IT is the future. I like to “play” with computers. In fact, I assembled one at home”*.

However, the cons for enrolling in IT outnumber the pros. As one of the students who enrolled for an IT bachelor’s degree points out, the social setting discouraged her due to the perception of IT being difficult, as opposed to female students who do not perceive it as particularly complex: *“Everybody kept telling me that it was very difficult, that it would be better for me to choose something else (...)”*. Interest in other BA’s, a lack of interest in the IT profession, unfamiliarity with careers prospects (*“I am pretty good at it but I don’t see professional opportunities...”*) and the IT profession being perceived as time consuming and sedentary (*“I don’t know...it discourages me to think that I could have to spend so much time glued to a chair”*) are yet more reasons why girls didn’t decide to pursue IT studies. There is also the perception of IT as involving the manipulation of

gadgets, cables etc. and the lack of perception of its social aspects: “(...) because for me IT it not a way of helping ...I mean, in physical therapy you truly can help a person in front of you. You can see his/her progress. I don't know if there is a straightforward manner to not just work with but also help the person concerned. In IT I don't see it...”. Finally, some girls claimed that the main reason not choose to IT was the maths: “I like computers, even programming, but there is maths and I am extremely bad at it...so...When I started baccalaureate I chose technology but by the time I had finished the first year I was not that interested anymore”.

In conclusion, stereotypes on the image of IT, its difficulty and its lack of social aspects, as well as the IT profession being seen as fixing computers, are still present. Therefore, in order to ensure greater access by women to higher education STEM programs, these should be tied their individual interests. An increased presence of women in STEM shouldn't be a matter of numbers to boost the neoliberal capitalistic system, but rather a matter of justice. Because society is an arena for both men and women, it seems essential to have a more balanced and proportional representation of both in STEM and its education programs. Therefore, improved participation in STEM programs and employment is not only an issue of increasing the numbers of students and workers, but is also an issue for diversity.

Case Study — Equality as an Instrument that Favours Access to Education and Subsequent Insertion into Academic and Research Activity: The Case of the University of Guadalajara (Mexico)

Martín Barajas, Martín E. Barajas, Jorge G. Bautista

Background

According to institutional statistics (*Numeralia Institucional*) on the University of Guadalajara (UdeG) published on 28 February 2019, enrolment for high school (*nivel medio superior*) is 160,430 students (72,129 male and 88,301 female), which shows a predominance of the females at this level of education. This phenomenon is replicated in higher education (*nivel superior*), whose enrolment of 127,330 is distributed between 60,348 men and 66,982 women (University of Guadalajara, 2019).

The previous figures reflect the enrolment behaviour at the UdeG and its distribution by gender. It is significant to note a predominance of females at both levels, which shows that the opportunities for accessing higher education at the UdeG do not pose any obstacles for either males or females. In the case of postgraduate students, although a predominance of males is observed (3,482 men versus 3,234 women), the difference is not markedly significant.

In the field of teaching, according to the *Numeralia Institucional*, the UdeG has an academic staff of 16,755 (9,516 men and 7,239 women). This distribution indicates a predominance of men. Even so, it also reflects major participation of women in teaching.

With regard to research, the staff of researchers and members of the National System of Researchers (*Sistema Nacional de Investigadores – SNI*), show that there is equality at the UdeG in terms of joining and remaining in such activity, given that 1,798 professors (1,051 men and 747 women) participate in

different research projects, while 1,285 (758 men and 527 women) are recognised by the *Sistema Nacional de Investigadores* (SNI). Although a predominance of males is identified, it is evident that women represent around 40% of the academics who do research work. In the field of research, for both genders, there are equal opportunities for obtaining an appointment as a Research Professor, with no further criteria than those established in the Regulations for the Entry, Promotion and Permanence of Academic Personnel (UdeG, 2019).

Although there is no discrimination against women at the UdeG, in terms of access to education and taking up an academic and research career, inequality is observed in other areas, given that the UdeG has never had a female rector, and just one female vice-rector. On the Council of Rectors (2016-2019 period), although participation of women (4) is observed, the predominance of men (11) is marked, with 70% of persons in such positions of responsibility being men. The Virtual University System (*Sistema de Universidad Virtual – SUV*) is led by a woman, and the High School Education System (*Sistema de Educación Media Superior – SEMS*) by a man. These figures reveal that, in terms of equality, the UdeG, should review and consider new policies, given that

“It is essential to improve the framework of guarantees as enshrined in the constitution, such as the right to participate in politics and access publicly elected positions, but also in the professional and socio-cultural realms.”breaking the glass ceiling ... requires cross-cutting policies and a systemic and holistic outlook. (Estrada et al. 2016)

In terms of management positions, in general, there is a more or less equitable distribution, given that in the administration that recently concluded, 86 women held a management position and 112 men did (UdeG, 2018).

What has been done?

Of particular prominence is the Institutional Gender Equality Project (*Proyecto Institucional de Igualdad de Género*), aimed at generating updated information regarding the gender equality perspective at the UdeG, which lays the foundations for an institutional policy on this issue, and which led to the UNESCO “Equality and non-discrimination” chair, which aims to encourage young university students to research and reflect on discrimination in society, and to conduct studies and proposals for social intervention aimed at preventing practices that breach universal rights. This project led to the seminar on “Dialogues on gender equality and mainstreaming”, and the course *Training on gender equality*.

The UdeG and the National Women’s Institute (*Instituto Nacional de las Mujeres –INMUJERES*) signed a general collaboration agreement, aimed at generating strategies to advance gender equality.

In addition, the Centre for Gender Studies (*Centro de Estudios de Género*) was created to design strategies and policies on equality that can impact the whole UdeG, and whose results have led to the publication of 15 books, all of them on the gender perspective.

Achievements

It may be over-presumptuous to assume that equality governs the fate of the UdeG. However, it would also be false to claim that the institution does not promote or respect this principle. At the UdeG, there is a significant sense of equality and it is being intensified on a daily basis. But this reality should not hinder the quest for better scenarios. On the contrary, it should encourage the entire community, and particularly the authorities, to understand that equality should always be the guiding principle of institutional life. If this is ever not the case, then the institution is failing society.

In the field of academic management, in terms of managerial positions, the institution needs to make greater efforts towards equality, under the understanding

that, in such a globalised world, in which democracy is hailed as the guiding principle for different activities, it is unacceptable that only a small sector of women are granted this responsibility. Achievement of such an apparently difficult goal requires a paradigm shift that, from a democratic and egalitarian vision, offers equal opportunities and demands government systems, as well as their institutions, to reformulate their policies to pursue an objective that, in the present times, demands an immediate response.

References

- Estrada Rodríguez, J.L.; Mendieta Ramírez, A.; González Vidaña, B. (2016). Perspectiva de género en México: Análisis de los obstáculos y limitaciones. *Opción*, vol. 32, n. 13, pp. 12-36.
- Universidad de Guadalajara. (2018). *Indicadores de Género UdeG*. Retrieved from <http://www.copladi.udg.mx/estadistica/indicadores-de-genero-udeg> (Accessed 04/07/2019).
- University of Guadalajara. (2019). *Reglamento de Ingreso, Promoción y Permanencia del Personal Académico de la Universidad de Guadalajara*. Retrieved from: <http://www.secgral.udg.mx/sites/archivos/normatividad/general/RIPPPA%20%28Abril%202019%29.pdf> (Accessed 10/27/2019).
- University of Guadalajara (2019). *Numeralia Institucional*. Retrieved from: <http://copladi.udg.mx/estadistica/numeralia> (Accessed 04/04/2019).

18. The ideological basis of humanism, as well as our conception of science and technology, is patriarchal. How can patriarchy be criticised and overcome in all areas of knowledge, both theoretical and practical?

Towards an Inclusive Paradigm: the Change from a Patriarchal Conception of Science

Maria José Prieto and Claudia Prats

Abstract

Science was born and understood as systematized knowledge based on observation and abstract rationalization and it has fundamentally been built based on fragmented and isolated scientific knowledge during a patriarchal period. This rational and analytical sense was necessary in order to complete the first stage of the consolidation of science and thus proceed towards the separation of the scientific branches, which led to the practical differentiation of knowledges such as humanities and experimental sciences. Moreover, it also mentions the importance of the understanding the functions of human brain asymmetry, whereby the right hemisphere has been related to female values and left hemisphere to male ones. Science should not continue to be defined and identified only from the understanding of the abstract, rational and logical part, but also from the analogical, intuitive and holistic, in order to achieve an integrative paradigm of science caused by the coordination of both hemispheres. This report reflects on the needs for change and to embrace the consideration of doing science with consciousness, which leads us away from the merely rational and exclusive, to the empathic and holistic. Finally, it also mentions the need to include synergy between different disciplines in order to continue to progress in an integral and inclusive science direction.

Introduction

The main humanistic conceptions and the path of Western culture, as well as the first definition of science, was born in the context of Classical Greek culture in the framework of global patriarchy. Later, the structuring of technologies and their applications would be conceived in accordance with the same paradigm.

Ancient cultures were built in the matrilineal context, meaning the organization of family relationships in societies according to lines of descent from female ancestors. It is also important to mention that the mythology itself explained the shift towards “the patriarchal”, meaning the establishment of the masculine values, primacy and power, and exemplified in different myths that show how men took control of knowledge and values (Abreu 2013; Campbell 2013).

Hence, it is interesting to present an approach to the content in connection to what is expressed when we refer to: “the masculine” and “the feminine” in order to understand the values, objectives and ways of seeing and doing that encompass these terms. We intend to frame the topic of patriarchy versus matriarchy from the broader, and hence more enlightening, perspective of values and energies. By doing so, it will be easier to understand why the defence of certain values has led to sterile and non-inclusive struggles between the genders. It will also be useful for understanding the long anchorage between science and patriarchal culture. Table 1 summarizes, in a broad sense, the meaning of “masculine” and “femenine” in terms of classical Western culture (Prieto 2017).

Table 1. Division between masculine and feminine in relation to values/roles (Prieto, M. J., 2017).

Masculine values	Feminine values
<p>The masculine is the pole of the human being that expresses:</p> <ul style="list-style-type: none"> • what is made of light, sun • of time, of momentum • of arousing power • of order, of exteriority • of positivity and dryness • of objectivity and reason 	<p>The feminine is the pole of the human being that expresses:</p> <ul style="list-style-type: none"> • the darkness, the night, the moon • mystery, death, interiority • the earth and feeling • negativity and humidity • receptivity • the generating force and vitality
<p>The male dimension belongs to:</p> <ul style="list-style-type: none"> • movement • towards transformation • towards aggression • towards transcendence • towards the clarity that distinguishes and separates • towards the ability to order • and projected into the future 	<p>The feminine dimension belongs to:</p> <ul style="list-style-type: none"> • quietness • immobility • the darkness that challenges curiosity • and to inquisition • immanence and • longing for the past
<p>Its main characteristics:</p> <ul style="list-style-type: none"> • Distance • Individuality, selfishness • Uniformity • Immediateness 	<p>Its main characteristics:</p> <ul style="list-style-type: none"> • Implication • Solidarity, empathy • Variety • Waiting
<p>It has been associated with:</p> <ul style="list-style-type: none"> • the right side • odd numbers (perfect) 	<p>It has been associated with:</p> <ul style="list-style-type: none"> • the left side • even numbers (imperfect)
<p>The Masculine assumes analytical thinking, independence and an attitude oriented towards concrete goals.</p>	<p>The Feminine represents feeling, interdependence and an attitude oriented towards the same process.</p>

Science was first conceived from the Platonic and Aristotelian worldview, based on abstract, rational and objective knowledge. Later, in the so-called “scientific revolution” of the seventeenth century, this conception of science was confirmed in the same way, which especially includes the objectively verifiable sensory experience. Table 2 summarizes the main ideas of scientific understanding in this period.

If we carefully examine the values and roles assigned to the masculine and feminine including the different ways of understanding and proceeding from them, and if we compare this with the original conception of science, it is clear that science was defined from a male perspective.

Furthermore, one of the biggest challenges is related to the shift towards the non-patriarchal, meaning the need to change the epistemological paradigm of science. In this sense, as shown in Table 3, a new understanding of science has grown out of the new epistemological worldview of the twentieth century.

However, this form of rational and analytical sense was also necessary to build the first blocks of the consolidation of science. An analytical view of science was also required on the path towards to the separation of scientific branches. This then led to the practical differentiation of knowledge into the likes of humanities and experimental sciences. The way science is conceived,

Table 2. Understanding of science from the ancient period and after the scientific-revolution (Prieto, M. J., 2017).

- The Aristotelian paradigm of Science was based on systematized knowledge that involved observation and rationalization in relation to the capacity for abstraction.

- Modernity and the mechanistic paradigm of science began with R. Descartes and F. Bacon. These authors remarked that any complex system needs to be divided in order to understand it. This led to a conception of the world based on the likelihood of the fragmentation of reality.

- The fragmentation of reality implies a conception of the world that considers that it can be divided into select groups, both the studied world and those who study it. So, these divisions flood not only the object of study, but also the study itself.

- Knowledge is created and based on isolated plots, although in tenuous communication. Thus, the subject was dissociated from science giving rise to scientific work that became impersonal.

- Knowledge is constituted as a system of autonomous experts working in isolation from each other, who jealously defend an object of study. At some point, scientists and academics became border guards responsible for avoiding conceptual invasions. Moreover, some scientific knowledge is more relevant than others.

Table 3. Understanding of science from the new knowledge of the twentieth century: proposal of a new integral emerging paradigm (Prieto, M. J., 2017).

- Linear mechanical models, cause and effect, cannot account of a reality whose complexity transcends the possibility of explaining such models.

- Matter does not exist. The energy is expressed in different degrees or forms.

- The dichotomies mind-body, natural-cultural, spirit-matter, individual-collectivity, male-female etc., are different levels of the same indivisible reality, of a unique “holomovement”.

- The relationship between levels is more synchronous than diachronic.

- The “representations” of reality involve the bias of perception and the origin of the subject-object duality.

- The existence of a “collective memory” that interrelates everything and that is at the same time “cause and effect”, that “goes together” with reality.

- Chaos and order, chance and determinism are by-products of this representation of the complexity field.

- Given the continuous relationship between Mind-Matter and the close connection between all levels of existence, the so-called “Immutable Laws” of the Science whether physical, biological or social, have been now understood as changing, interdependent and evolving laws.

Science should be related to a dynamic, fractal and evolving knowledge including an epistemic and cooperative interdisciplinary network.

Science was born and understood as systematized knowledge based on observation and rationalization. Moreover, science has been constructed on the basis of fragmented and isolated scientific knowledge.

organized and developed was built under the same paradigm. Thus, the hierarchical and competitive way that individuals and groups do science should be emphasized, and this also becomes evident in the way things are taught.

Moreover, from the biological point of view, some recent studies have observed an association between hormone levels and competitive behaviour. Social behaviour may in part be driven by changes in hormone levels. Testosterone is a major influence on bodily and behavioural features seen as male and/or masculine. Although it exists and functions similarly in women and men, men have markedly higher average testosterone levels than women. This difference is widely presumed to be sex-based, i.e. caused by innate and evolved influences (Van Anders 2013). In greater detail, according to recent studies (Wu, Y et al 2017), testosterone levels fluctuate as a function of the outcome of competitive interactions. Thus, winning a competition has been classically associated with a rise in social status and increase in testosterone levels, whereas losing a competition is associated with a drop in status and testosterone. This means that changes in testosterone levels have important consequences for on-going behaviour.

It is interesting to highlight some points in consideration of all the above. First, the curricular selection criteria imply a hierarchical structure related to the prevalence of the main masculine values, referring to the ultimate importance of the quantity/quality of publications and analytical skills, rather than also considering the quality human skills related to teamwork, flexibility, capacity for abstract thinking and scientific creativity, among others. Second, considering that we are all victims of the same economic system, extreme importance is put on scientific productivity in terms of publications. This is also related to masculine values, because it is oriented towards a concrete goal rather than considering a scientific process that embraces the needs and development of human society. Third, the main objective of research is sometimes permeated by a masculine concern for the economic system, whereby there is greater interest in investing in topics that are advantageous to men, such as, for example, the predominance of female contraceptives rather than male contraceptives.

The curricular selection criteria imply a hierarchical structure related to the prevalence of the main masculine values, referring to the ultimate importance of the quantity/quality of publications and analytical skills, rather than also considering the quality human skills related to teamwork, flexibility, capacity for abstract thinking and scientific creativity, among others

However, before analysing and proposing possible strategies for change in this sense, it is also worth mentioning the importance of progress in neuroscience. New knowledge of our brain, mind and consciousness was needed in order to understand how information is processed, among other matters. The author Iain MacGilchrist described how the asymmetric brain involves the left and the right hemispheres processing information differently (McGilchrist 2011). Table 4 summarizes his main points referring to each hemisphere. This also means that each hemisphere's function is established in a hegemonic manner.

The information in this table also shows the parallelism between these values and those shown in the previous picture of the male and female ways of seeing. Interestingly, the classical definitions of right and left were related to male and female respectively in terms of gender. In terms of brain function, the right hemisphere has been related to female values and left to males ones, but neuroscience has shown that the two hemispheres of the brain work together in all cognitive tasks (Weigmann 2013).

So, according to McGilchrist, the forces of the left hemisphere, which are currently culturally hegemonic, would evidently resist, so it would indeed probably be very hard for us to understand those forces all. Moreover, he suggests that the very way we come to understand the right and left hemispheres is itself one of the things that our left-hemisphere-dominated worldview has most crucially distorted (McGilchrist 2011), for instance, the way that the right hemisphere has long been deemed the 'minor' hemisphere in much of the scientific world.

It is also important to mention the role that corpus callosum plays in maintaining the correct brain functionality. In recent years, cognitive neuroscience has been concerned with the role of the corpus callosum and interhemispheric communication for lower-level processes and higher-order cognitive functions. There is empirical evidence that not only callosal dis-

connection but also subtle degradation of the corpus callosum can influence the transfer of information and integration between the hemispheres (Schulte and Müller-Oehring 2010). He gives a powerful argument about how 'information' as a concept only suits the left hemisphere, not the right, so this model of the mind cannot accommodate any of the strengths of the right hemisphere. In this sense, it is important to note that in order to achieve a possible new paradigm that involves

the integration of both hemispheres' functions, there is a need for responsible, conscious work on the individual capacity for integrating both.

Our suggestion resulting from this simple understanding, at least on a theoretical level, is to foster change from the patriarchal way of understanding to another, though not precisely the opposite, namely the matriarchal way.

Table 4. Brain hemisphere function and information processing

Left	Right
<ul style="list-style-type: none"> • Verbal: Uses words to name, describe, define 	<ul style="list-style-type: none"> • Non-verbal: Is aware of things, but finds it difficult to relate them to words
<ul style="list-style-type: none"> • Analytical: Studies things step by step and part by part 	<ul style="list-style-type: none"> • Synthetic: Groups things together to form sets
<ul style="list-style-type: none"> • Symbolic: Uses a symbol representing something. For example, a drawing means "eye"; the + sign represents the process of addition 	<ul style="list-style-type: none"> • Concrete: Captures things as they are, in the present moment
<ul style="list-style-type: none"> • Abstract: Takes a small piece of information and uses it to represent the whole 	<ul style="list-style-type: none"> • Analogue: Sees the similarities between things; understands metaphorical relationships
<ul style="list-style-type: none"> • Temporary: Follows the passage of time, orders things in sequences: starts at the beginning, relates the past with the future, etc 	<ul style="list-style-type: none"> • Timeless: No sense of time, centred in the present moment
<ul style="list-style-type: none"> • Rational: Draws conclusions based on reason and data 	<ul style="list-style-type: none"> • Not rational: Does not need a basis of reason, nor one based on facts, tends to postpone judgments
<ul style="list-style-type: none"> • Digital: Uses numbers, such as when counting 	<ul style="list-style-type: none"> • Spatial: Sees where things are in relation to other things, and how the parts combine to form a whole
<ul style="list-style-type: none"> • Logical: Conclusions are based on logic: one thing follows another in a logical order. For example, a mathematical theorem or a reasoned argument 	<ul style="list-style-type: none"> • Intuitive: Has sudden inspirations, sometimes based on incomplete patterns, clues, hunches or visual images
<ul style="list-style-type: none"> • Linear: Thinks in terms of linked ideas, one thought follows another and converges, often reaching a conclusion 	<ul style="list-style-type: none"> • Holistic: Sees complete things, at once; perceives general patterns and structures, often reaching divergent conclusions

In short, we could summarize three main points: i) male and female values have been understood in a dichotomous way, ii) classical science has been built in this dichotomous environment and from a patriarchal point of view, iii) there is a need to consider a new science paradigm that includes an integrative vision of science, as the new knowledge about hemisphere function and brain asymmetry has led us to a new understanding of how the brain functions and has paved the way towards proposals for change.

The deep understanding of male and female values and energies and our understanding of the way our brain processes information must first be transferred into the new epistemological paradigm on the level of science itself that we call “integral”. That is, science cannot continue to be defined and conducted only from an understanding of the abstract, rational, logical and linear but also from the analogical, intuitive and holistic, to mention some components of the other way of seeing and understanding. Similarly, technology cannot continue to be seen exclusively as the tool for transformation towards specific goals, i.e. the pragmatic approach, but also as what helps and collaborates with the proper functioning of the entire system.

This change is proposed as something that has been explicit in the development of science in the last century and that many authors have already called attention to as the “obsolete scientific” paradigm (Sheldrake 2012). It is proposed as a necessary step on the evolutionary path of humanity and of the individual and collective demands of men and women, especially those who have contributed to the improvement of culture and science. This change is not only proposed as a new imposition, but from the clamor of the earth itself and also from the values and energies of ecofeminism (Mies and Shiva 1993). Moreover, this proposal needs to be contemplated as a personal and collective advancement of consciousness, i.e. the need to do “science with consciousness”, leading us away from the merely “rational” and exclusive, towards the empathic and holistic, which incorporates everyone and everything.

Since fragmentation critically limits scientific progress, it is important to consider a change that can lead us towards the unity of science. And that means keeping in mind a new concept of unity that is understood as a plural and complex system.

Conclusion

In short, the main topics mentioned in this report were: i) historical overview of the concept of science dominated by male values (patriarchy), ii) the need to shift from the classical epistemological paradigm of science towards a new one that is more integrative, iii) the importance of delving deeper into theoretical / practical knowledge of the functions of the brain in terms of the different ways that the two hemispheres process and the relationship between them and iv) other behavioural patterns that are related to certain biological gender differences.

From an educative point of view, we believe that it would be interesting to offer different kind of subjects related not only to an understanding of epistemological science and its historical context but also to the development of consciousness and its importance in the ways of doing science. It is also necessary to educate students from early on, for there is a need to include synergy between different disciplines in order to keep progressing in the direction of integral science. It is essential to promote awareness of the importance of certain disciplines such as neuroscience for contributing to educational progress. This means that advances in research of the brain can elucidate learning processes and consciousness, and this knowledge will inform the design of education programmes.

Advances in research of the brain can elucidate learning processes and consciousness, and this knowledge will inform the design of education programmes

To conclude, we would like to recap a few take-home messages for the better understating of the essence of this report (see Box 1).

The main points mentioned above may attribute more importance to the completion of educational programs that include more integrative subjects that consider these topics.

Take-home messages

- The first point is to consider the male and female values of each person irrespective of gender and culture.
- Second, until now science and culture have been developed from a patriarchal worldview.
- Third, the significant requirement for scientific change from the classical methodological scientific understanding towards an integral way of building science.
- Fourth, the important role of neuroscience for continuing to understand more about how the brain functions and its relationship with behaviour and consciousness.
- Fifth, the change from the patriarchal paradigm should be related to integral knowledge of science, highlighting ecological consciousness.

In addition, the shift from the patriarchal system to another must be linked to the fostering of awareness about all these points in order to move away from the consolidated patterns related to power and hierarchy.

Finally, the authors of this report would like to support the emerging paradigm that scientific progress is closely related to the progression of consciousness, both in personal and collective terms.

References

- Abreu, F. M.-C. (2013). Sexualidad femenina en ritos, obras de arte y mitos: Del mundo de la Diosa a la sociedad patriarcal. *CHIADO Books*, vol.2.
- Campbell, J. (2013). Goddesses: Mysteries of the Feminine Divine In *Collected Works of Joseph Campbell*, Novato, CA: New World Library.
- Mies M. and S. Vandana. (1993). *Ecofeminism*. Fernwood Publications, Halifax, Nova Scotia, Canada.
- McGilchrist, I. (2011). *The master and his emissary: the divided brain and the making of the Western World*, New Haven and London, Yale University Press, 2010
- Prieto, M. J. (2017). Pensar la ciencia desde la biología. *Una visión evolutiva del conocimiento biológico*. Barcelona: Ediciones de la Universidad de Barcelona.
- Tilman S. and Muller-Oehring, E. M. (2010). Contribution of Callosal Connections to the Interhemispheric Integration of Visuomotor and Cognitive Processes. *Neuropsychol Rev*, 20(2), pp. 174–190.
- Sheldrake, R. (2012). *The Science Delusion: Freeing the spirit of enquiry*, London: Coronet.
- Van Anders SM. (2013). Beyond masculinity: testosterone, gender/sex, and human social behaviour in a comparative context, *Front Neuroendocrinol*, 34(3), pp. 198–210.
- Weigmann K. (2013). Educating the brain. The growing knowledge about how our brain works can inform educational programmes and approaches, in particular, for children with learning problems, *Science and Society. EMBO Rep*. 14(2), pp. 136-139, doi: [HYPERLINK "https://dx.doi.org/10.1038%2Fembor.2012.213"](https://dx.doi.org/10.1038%2Fembor.2012.213)10.1038/embor.2012.213
- Wilber K. (1982). *The Holographic Paradigm and Other Paradoxes: Exploring the Leading Edge of Science* Boulder/ London: Shambhala.
- Wu, Y., Eisenegger, C., et al. (2017). The role of social status and testosterone in human conspicuous consumption. *Scientific Reports*, 7 (11803).

19. How can a trans-disciplinary gender approach be developed, beyond gender studies as a specific branch of each area of knowledge, which are usually only developed by women and for women?

Gender Equality: Is It a Matter of Education?

Amal Al-Malki

Abstract

This paper investigates whether Gender Studies can transcend disciplinary boundaries and become part of the basic foundational body of knowledge in any given education institution. The answer is far more complex than merely stating that it can, because the issue is not as linear as one might assume. A trans-disciplinary approach to Gender Studies is indeed possible but is neither sustainable nor realistic unless it is embedded into the socio-economic and political context that shapes our education systems. Gender mainstreaming in education can be implemented in an effort to integrate gender equality and even more so to scale it through a trans-disciplinary gender approach. There is also the question of the relevance and impact of the education system on society and its collaborative efforts to serve the joint agenda of social change and social justice. It is therefore a quest for a national agenda rather than a shared curriculum, and for endorsement and adoption by the public and the state.

This paper aims to answer the following question: Can Gender Studies transcend disciplinary boundaries and become part of the basic foundational body of knowledge in any given education institution? A satisfactory answer would entail more than a 'yes' as the issue is not as linear as one might assume. A trans-disciplinary approach to Gender Studies is indeed possible but is not sustainable or realistic if it is not embedded into the socio-economic and political context that shapes our education systems. Therefore, the quest is for a national agenda rather than a shared curriculum, for endorsement and adoption by the public and the state.

Gender Studies and Interdisciplinarity

While Gender Studies is viewed as a legitimate academic field in its own right, it is one of the areas of knowledge that permeates other areas, due to its embedded cross-disciplinary features. The very word 'studies' indicates the interdisciplinarity of the academic field by referring to the modern phenomenon of combined studies, where multiple fields are introduced to cover or investigate a thread or threads of knowledge; consider studies in a specific area, post-colonial studies, cultural studies, etc. This post Second World War phenomenon entered academia in an attempt to deal with a changing world, challenge traditional canons, and emphasize areas of knowledge that were previously marginalized.

Hence, it is understandable that the field of Gender Studies and its inherent consideration of women's issues (which this paper will focus on) is both interdisciplinary and multidisciplinary, spilling over into other fields of knowledge, as we are witnessing today. Students from business, law, literature, languages, sociology, anthropology and theology are crossing the traditional divide between disciplines and taking courses, producing research, and requesting supervision and mentorships from departments and centers of women and gender studies. Cross-disciplinary research projects on women

and gender reach out to other disciplines and borrow tools from them in some instances, or frameworks in other instances, to study how issues pertaining to women and gender interplay with their topics. Consider for example legal, religious, and human rights' frameworks applied to the study of specific populations of oppressed women, or the use of digital media and mobile applications to raise awareness about gender-based violence in certain contexts.

This academic awakening, commendable as it is, needs to be grounded in a sustainable approach in order to have permanent effects. Academic administrators in decision-making positions need to collectively decide to usher academia out of its pigeonhole-like approach and towards a more holistic and comprehensive one that would be a better reflection of reality - with all of its ups and downs. Such innovative re-shuffling needs to address difficult core topics, one of which is gender. There is a need for a trans-disciplinary approach to Gender Studies, one where women and gender issues are integrated as fundamental components of all academic and vocational fields. Such an approach serves not only academia but extends to outside communities as well. But before describing the social impact of a trans-disciplinary approach, we shall first consider how it can be done within academia, and in particular in higher education, with some reference to important factors within K-12 education as well.

Trans-disciplinary Approach to Gender Studies

There is a need for an approach to Gender Studies that transcends disciplinary boundaries in academia. One of the approaches that has been developed and used is Gender Mainstreaming, according to which different policies, regulations, programs and initiatives are assessed with respect to their effects on men and women. Gender mainstreaming involves raising awareness about gender differences and the specific things that need to be done to ensure equality between men and women. "Mainstreaming a gender perspective was globally established as a strategy for promoting gender equality through the adoption of the Platform for Action at the UN Fourth World Conference on Women held in Beijing in 1995."⁽¹⁾

Gender mainstreaming in education can be implemented in an effort to integrate gender equality across the education sector through a trans-disciplinary gender approach. The inclusion of a gender perspective needs the expert intervention of Gender Studies at the level of curricular design with a cross-disciplinary approach, which can be achieved by offering foundational courses on gender to all students in all departments or by embedding gender-aware topics in the curricula of different departments. Moreover, a trans-disciplinary approach to gender equality ensures that women are educated in all disciplines and hopefully at all levels with the intention, strategy and plan to serve an equity agenda that needs be mainstreamed, and take the theories and practices offered within Gender Studies and build them into other curricula, creating new and dynamic academic dialogues on gender and gender parity in modern and just societies.

Gender mainstreaming in education is a step towards resisting gender-biased knowledge as well as gender-biased education by mainstreaming women and Gender Studies, taking them out of their confines and into the public domain where gender equality becomes the responsibility of all. Hence, gender mainstreaming helps to create a shared narrative on gender equality in education.

Gender Mainstreaming and Education

Gender mainstreaming through a trans-disciplinary academic approach transforms education and makes it more relevant. Education still holds its entrenched importance as the core of all progress and the foundation of all sustainable change. It is imperative that when talking about education and women, we highlight the impact of education on the lives of women and their communities. Education of women in general empowers their sense of existence as independent human beings. Tertiary education empowers their economic status and financial independence, which by default reflects positively on their local and extended communities and positions them as contributors to their own livelihoods and by extension their nations' economies.

1. Sida. (2015). Gender Mainstreaming. P. 2. Available at: <https://www.sida.se/contentassets/3a820dbd152f4fca98bacde8a8101e15/gender-tool-mainstreaming.pdf>

Gender mainstreaming in education focuses on institutionalizing policies that ensure parity. It goes beyond access to education, which is considered a human right, to equal representation, equal opportunity, equal pay, and more. It also focuses on both the importance of education and on empowering females within the field of education, by using gender equity frameworks, working to eliminate gender disparities, and ensuring that women have access to different fields and levels of education.

Moving away from restrictive and archaic views on female education, Gender Mainstreaming ensures that girls and women not only have better access to education, but are also represented in all disciplines as both staff and faculty members. This approach again eradicates the old institutionalized modes and structures that have confined them within specific education disciplines. The approach offers a new interpretation of women's education as a continuum that taps into women and Gender Studies as well as national and international agendas on human rights, to eliminate discrimination and entrench gender equality.

The gender mainstreaming approach is also concerned with issues of gender representation in the content of all education materials, which must serve and promote the gender equity agenda. It examines how the female and male genders are represented in all subject materials and how their representation can be changed from evoking limited traditional or stereotypical roles and perspectives to ones that serve a gender parity agenda. Of course this is not an easy undertaking and requires the revision of education policies on a national level. Gender Mainstreaming should be embedded in the education philosophy of all education institutions.

Higher education is more globalized than ever as universities worldwide are transcending geographical boundaries through collaborative initiatives such as joint degrees, shared curricula, the establishment of satellite campuses, and student and faculty exchanges. The internationalization of universities has become a strategic goal that supports the building of global communities and participation in the global market. The global perspective in higher education also creates a shared global rhetoric on freedom, rights and equality. Higher education is also expected to engage with and adhere to international treaties and guidelines that are set by intergovernmental organizations such as the United Nations. For example, the United Nations' 17 Sus-

tainable Development Goals (SDGs) were adopted by 193 member countries. The goals are to be achieved by 2030 and involve a wide range of sectors and institutions on local, regional and international levels.

Higher Education and the Sustainable Development Goals

Universities worldwide are committing to the UN SDGs by innovating their curricula. In 2019, Times Higher Education (THE) developed a university impact ranking based on metrics that assess the performance of universities against 11 of the 17 SDGs. Their first ranking in 2019 included 450 universities from 76 countries. New Zealand's University of Auckland came top of the list, followed by Canada's McMaster University and University of British Columbia and the UK's University of Manchester. The ranking looked at how the universities are delivering and meeting the 11 SDGs through three broad areas of assessment: research, outreach, and stewardship (2019).⁽²⁾

"Gender Equality" is the fifth goal for achieving a sustainable future, although all of them are interrelated and interconnected. Gender equality in particular resonates with the other goals. For example, SDG 8, "Decent Work and Economic Growth," focuses one of its principles on the gender pay gap, and lays out policies and practices that would eliminate it. Gender equality is applicable to other SDGs, such as SDG 3 "Good Health and Well-being", SDG 4 "Quality Education", and SDG 10 "Reduced Inequalities". The interrelatedness of all of the SDGs is what makes them a realistic roadmap towards a sustainable future.

The Gender Equality SDG situates women at the center of the gender equality narrative and calls for global engagement to support them "to achieve gender equality and empower all women and girls"⁽³⁾. The goal covers access to education, equal opportunities, as well as mentorship, training, promotion, policies and processes for the protection of women among other areas. The goal can be measured in universities through a specif-

2. University Impact Ranking by THE. See: https://www.timeshighereducation.com/rankings/impact/2019/overall#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/undefined
 3. <https://www.un.org/sustainabledevelopment/wp-content/uploads/2016/08/5.pdf>

ic methodology developed by THE⁽⁴⁾, which includes the research produced on issues of gender, how much research is conducted by women, what policies are in place to promote gender equality, and the level of female representation across students, staff and faculty.⁽⁵⁾

A look at the universities that ranked highest for SDG 5: Gender Equality gives us insight into best practices towards building a trans-disciplinary gender approach within the framework of an education institution. The highest ranking university in gender equality is Western Sydney University in Australia. It has implemented a *Gender Equality Strategy and Action Plan* for 2015-2020. It is also dedicated to combatting sexual violence and has created an education program to promote healthy relationships between men and women on campus. The University was awarded an Employer of Choice for Gender Equality (EOCGE) citation by the Federal Government's Workplace Gender Equality Agency, a title that the university has held for the last 14 years.⁽⁵⁾ The top five universities within this criterion have made substantial contributions to research on gender, created measures and frameworks to combat discrimination and violence against women, and implemented policies to ensure equal opportunity, retention and promotion of women.

But how can we ensure that universities' efforts to meet this SDG extend beyond their walls to other education institutions and even to society at large? SDG 17 focuses on partnerships as a fundamental means for goals to permeate society at large by involving different stakeholders, who can also ensure that different sectors (government, private, public) abide by these goals and fulfill their responsibilities. But how can the progress achieved by universities have a wider social impact?

Gender Gap Reports published by the World Economic Forum, we find a dichotomous and rather fragmented picture of gender equality world-wide. The 2018 report states that across the 149 countries that were assessed, "the largest gender disparity is on Political Empowerment, which today maintains a gap of 77.7%. The Economic Participation and Opportunity gap is the second-largest at 41.9% while the Educational Attainment and Health and Survival gaps are significantly lower at 4.4% and 4.6% respectively."⁽⁶⁾ The report also predicts that it will take 108 years to close the gender gap in 106 countries, but in the Middle East and North Africa (MENA) region it will take much longer: 153 years.

MENA is a wide region with considerably diverse challenges, gender equality being a crucial one. Of course, reasons and factors contributing to persistent inequalities are different from one area to another. For example, Tunisia ranked 119 on the highest in the MENA region -- while Yemen was bottom at 149. The *Arab Human Development Report 2002*⁽⁷⁾, the first of a series of such UNDP reports for the Arab States, reveals three critical deficits faced by all Arab countries: "freedom, empowerment of women, and knowledge" (p. 24). Four years later, the 2005 report, dedicated to women and titled *Towards the Rise of Women in the Arab World*⁽⁸⁾, revealed the many deficits and shortfalls of Arab countries when it comes to gender equality. It summarizes the main challenges facing women in Arab countries and states that, "In public life, cultural, legal, social, economic and political factors impede women's equal access to education, health, job opportunities, citizenship rights and representation. In private life, traditional patterns of upbringing and discriminatory family and personal status laws perpetuate inequality and subordination".

Most countries worldwide have achieved some progress in the area of education, however, it seems that those achievements are not scaling or transferring to other areas or sectors in their societies. One area in which transfer can easily be measured to a certain extent is between education and the job market. The economic impact and the correlation between education and employment is certainly a force behind women's education in many societies, especially in economically

Education and Human Development

Education is a main enabler that gives women the confidence and ability to control their lives (even in the face of significant limitations in some cases) as it empowers them to experiment and expand their horizons. However, when we look at the rankings in the *Global*

4. <https://www.timeshighereducation.com/world-university-rankings/impact-rankings-2019-methodology-gender-equality>
5. <https://www.timeshighereducation.com/student/best-universities/top-universities-tackling-gender-equality>

6. <http://reports.weforum.org/global-gender-gap-report-2018/>
7. <http://www.arab-hdr.org/reports/2002/english/ahdr2002e.pdf?download>
8. <http://www.arab-hdr.org/reports/2005/english/ch10-e2005.pdf?download>

challenged countries where women are needed to participate in the job market and contribute to the national economies. Gender equality is seen as a catalyst for progress and development. It is called “smart economics” by the World Bank because of its importance for increasing the productivity rate among both men and women. Its is transferred to the children of these economically active women, and it helps to build a more inclusive, just and equal society.⁽⁹⁾

However, data suggests that there is still a disconnection between a woman’s access to education and her contribution to the job market. For example, the United Nations Development Programme’s *Human Development Report of 2018*⁽¹⁰⁾ shows that: “Global labor force participation rates for women are lower than for men – 49 percent versus 75 percent. And when women are in the labor market, their unemployment rates are 24 percent higher than their male counterparts. Women globally also do much more unpaid domestic and care work than men”⁽¹¹⁾. Zooming in on the MENA region, we find similar trends. What is known as the MENA Paradox refers to discrepancies between greater access to education and the resulting increase in the number of women graduates and the paradoxically low numbers of women entering the market and their low participation in the workforce. In other words, despite the increasing number of women with tertiary education, they are still under-represented in the workforce. “Workforce participation gender gaps currently remain wide across the region, ranging from just over 40 percent in Kuwait and Qatar to nearly 80 percent in Algeria and Jordan, reflecting an inefficient use of education investment”.⁽¹²⁾

These numbers reveal that something is missing. An education system that produces more female graduates should definitely be commended; however, why are women still under-represented in the workforce? Could it be that women have been given greater access to higher education, or that higher education has managed to build integrative mechanisms for women, while the workforce is still discriminatory against them? In reality, are gender discrimination and gender roles

and norms stifling educated women from contributing to their national economies? This raises the question about the scale of impact that education should have on society at large. Consider the example of women and education in the Middle East. Why does women’s education, as much as it is celebrated within these societies, tell only half of the story? What is missing from the correlation between the higher numbers of educated women and social progress with respect to gender equity are the hidden truths that are embedded within a complex socio-economic and political structure that disables women and stifles their aspirations.

Schools and universities do not live in a vacuum, they belong to systems that they either abide by, or converse and negotiate with. National and global challenges are drivers of education policies and help to shape education priorities. And gender equality is definitely a global priority. While education institutions worldwide are renegotiating their role in human development and the scale of their impact beyond academia, gender equality remains one of those priorities that are not fully taken into consideration. It is still disconnected from the overall development agenda, when it should be one of the main pillars of any education policy. Gender equality needs to be mainstreamed through a comprehensive gender approach that ensures that the message is unified between theory and practice, and that the same message resonates in society and becomes the common code of conduct. Advocating education as a path towards gender equality will not bear fruit unless gender equality becomes a part of national policy. Countries that have committed to the SDGs need to include Goal 5 in their national vision and implement it through different interrelated paths and venues. Education is only one of those paths. First steps are important, and the first step would be to implement a gender equality plan from a trans-disciplinary gender approach, one that will lead to the mainstreaming of women and gender specific topics that were previously presented within the confines of Gender Studies. And through the interplay of political will, institutional reform, and people’s engagement, education will certainly scale up its impact.

9. The World Bank. (2012). *World Development Report 2012 Gender Equality and Development*. Available at: <https://openknowledge.worldbank.org/handle/10986/4391>

10. <http://hdr.undp.org/en/2018-update>

11. UNDP. (2018). *Human Development Reports: Statistical Update*, see: <http://hdr.undp.org/en/2018-update>.

12. World Economic Forum. (2017). *The Future of Jobs and Skills in the Middle East and North Africa*. Available at: <http://www3.weforum.org/docs/>

Promising Example from Qatar

The importance of the new Master's program in "Women, Society, and Development,"⁽¹³⁾ launched in 2017 at Hamad bin Khalifa University, stems from multiple factors. It is the only Women Studies program in the State of Qatar. It is also an interdisciplinary one that draws from Gender Studies and Feminist Studies, but also Development and Cultural and Social Studies. It covers a wide range of topics and introduces vocational and training modules on gender analysis and gender mainstreaming. It also embeds a student job placement module that exposes students to the practical element that the job of a gender specialist would entail, and places them in a real-work context within different entities. And most importantly, the importance of the program lies in the ecosystem the university is embedded in. Hamad bin Khalifa University is a member of Qatar Foundation, which comprises 50 entities working across education, research, and community development.

The Education City which houses the university is also home to K-12 schools, including specialized schools, such as Renad Academy, which is for children with mild to moderate Autism Spectrum Disorder (ASD), and Awsaj Academy, which targets students with mild to moderate learning challenges. It also has eight branch campuses of top Western universities: Georgetown, Carnegie Mellon, Northwestern, Texas A&M, Virginia Commonwealth, Weill Cornell Medicine, University College London (UCL), and HEC Paris. Qatar Foundation has contributed to a thriving climate that connects education, community, and decision and policy makers. The number of female graduates across Education City has increased dramatically, feeding the job market and more importantly providing new career areas with their first female employees. For example, at Texas A&M-Qatar, 46 percent of the student body are women and 51.6 percent of undergraduate engineers are women.

The MA in Women, Society, and Development has the advantage of tapping into its rich surroundings and benefitting from collaboration and partnerships. Any joint partnership ensures the relevancy and the scale of impact, which is what the program strives to achieve. The program aims to help to fulfill its college's

"Social Justice" objective by promoting gender equality beyond the college, and throughout Qatar Foundation and the wider community in Qatar. It plans to do that by graduating gender experts in different fields, and nurturing gender-informed representatives of government entities, NGOs, and civil society. Moreover, the program aims to widen the scope of its collaboration to reach out to and involve different communities and build alliances, through knowledge transfer and capacity building.

Conclusion

A trans-disciplinary gender approach that is based on Gender Studies requires institutional commitment and a top-down decision process. Gender Studies offer the foundational theoretical framework and gender mainstreaming can be used as a means to achieve gender equality in education. Still, the education sector needs to play a leading role in transforming the education-based gender equality agenda into a social agenda that concerns society as a whole. Higher education can certainly lead the way through knowledge transfer, capacity building, and partnering with the main stakeholders in society.

13. <https://www.hbku.edu.qa/en/chss/ma-women-society-development>

Case Study — The Innovative Gender Studies Program at Sciences Po, Paris

Hélène Périvier

Sciences Po is a world-class international research university that is both selective and open onto the world. It follows a unique academic model that combines expertise in social sciences with transdisciplinary and vocational grounding to educate professionals and citizens to understand and transform society. Since its creation 150 years ago, Sciences Po has been constantly reinventing itself.

In 2010, led by two economists, Hélène Périvier and Françoise Milewski, Sciences Po launched PRESAGE⁽¹⁾, *Programme de recherche et d'enseignement des savoirs sur le genre*, its research and teaching programme on gender. This transdisciplinary programme developed its own approach to the expansion of gender studies at the institution. PRESAGE is grounded on the postulate that gender studies are not a discipline per se but a research field that requires skills, tools and methodologies from all social sciences. This approach also fosters the dissemination of the gender perspective in all social sciences.

The aim of PRESAGE is not to provide a specific training programme on gender studies to certain students, but to make sure that every young graduate has taken at least one course (or more) on this topic. The PRESAGE programme aims to embed a gender perspective in all curricula, in all disciplines, taught at Sciences Po: economics, political sciences, sociology, law and history.

The Undergraduate College offers seven geographical concentrations: Asia, North America, Africa, Franco-German relations, Central and Eastern Europe, Latin America, and the Middle-East. The gender studies courses are tailored accordingly: gender questions are considered within each specific regional context. For example, a course on *“Women in the contemporary Middle East”* is taught in the Middle-East concentration, and a course on *“Gender, Sexual diversity and Law in Latin America”* is taught in Spanish in the Latin America concentration.

Fundamental education is offered across the five principal disciplines at the Undergraduate level. The PRESAGE programme captures gender perspectives within each discipline and offers introductory courses in each field: Undergraduate students can take courses on *“Gender and Queer Law”*, *“Gender Challenge in Political Science”*, *“Gender, Sexuality and Mass Dictatorship”*, *“Sociology through the Prism of Gender”*, and *“Gender Challenge in Economy”*.

Promoting a transdisciplinary approach, PRESAGE also launched an *“Introduction to Gender Studies”* seminar in 2018: for one semester, first-year Undergraduate College students discover this field through the lenses of social sciences. The seminar offers an exploratory analysis of gender studies and gender inequalities, using four disciplinary approaches to economy, history, law, and sociology.

The SETs (Students' Evaluations of Teachers) and the different feedback on the different courses offered at Sciences Po shed unambiguous light on the interests in this field of students from all around the world. Indeed, the demand for graduate level gender courses is increasing at Sciences Po. The PRESAGE programme has set itself the goal of developing and promoting the course for offer within each of the seven Sciences Po Graduate schools: the Law School, Doctoral School, School of Journalism, School of International Affairs, School of Public Affairs, Urban School, and the School of Management and Innovation.

With transdisciplinarity being at the heart of Sciences Po's academic model, it seemed obvious that it should offer general gender courses that bring together students from the seven graduate schools, from various disciplinary backgrounds and interests. Two courses of this kind are offered at the master's level: one focusing on equality in politics, another on gender equality and public policies. Every year, auditoriums are packed with students showing a firm interest in the topics covered.

1. <https://sciencespo.fr/programme-presage/en.html>

PRESAGE works to embed the gender perspective in each graduate specialization whilst complying with each school's educational activities. For example, the Sciences Po School of Public Affairs developed case-based teaching: a dynamic form of pedagogy that seeks to insert students in complex situations in order for them to grasp, from the inside, the various stages and aspects of a public policy challenge. PRESAGE developed different case studies related to gender issues. One explores a policy adopted by Facebook and Apple in the United States in 2012 that offers to cover the cost of egg-freezing for their female employees. The course is based on inversed pedagogy in the sense that it is students' role to answer the questions raised by the case. In the context of this particular case, the following challenging question was asked: Is this policy a tool to promote gender equality in the workplace or a new form of oppression?

The objective at the graduate level is to disseminate knowledge on gender in a lively learning environment: both researchers and practitioners contribute together to enrich the courses. For example, at the School of International Affairs, the Head of the Gender, Education, Population and Youth Unit of the French Ministry of Foreign Affairs teaches about UN actions for women's rights and gender equality, while a sociologist teaches a course on gender and development from a rights-based approach.

These efforts to gradually embed gender perspectives in the curriculum make PRESAGE a relevant transdisciplinary initiative at Sciences Po and in France. Faculty, deans and academic coordinators are progressively taking up the issue and making sure that each programme includes consideration of gender issues. The choice of a transversal program rather than a specific unit, or center dedicated to gender studies is based on the richness that is brought by all disciplines and on the fact that it generates a dynamic relationship between all research centers in the field. It is also a way to prevent gender studies from being segregated as an isolated unit.

Driven by PRESAGE, Sciences Po is about to start offering a gender certificate that will add value to the diplomas of those graduate students who took courses on the specific background and knowledge of gender issues.

Most of the events organized by PRESAGE are open to both Sciences Po students and to the general public: they often offer a chance to gather interest-based com-

munities and to debate specific subjects from different perspectives and experiences. In the past academic year, we have covered a wide range of topics, from restorative justice in rape cases, to gender budgeting, and female rappers in the music industry. This is an efficient way to build bridges between the academic sphere and society, and to enrich the public debate on gender equality.

The PRESAGE programme is based on the assertion that gender studies do not constitute an academic discipline, but rather a field of research that is constantly being refreshed. It is our goal, as researchers and educators, to keep reinventing and adapting our educational models in order to prepare educated citizens of tomorrow to have an impact on the world and to transform society in a gender-neutral way.

Part 8

Environmental

20. Traditional Humanities have been developed in terms of such contrasts as those between nature/culture, natural/artificial, civilised life/uncivilised life, etc. In the time of the Anthropocene, how can this dualism be overcome in different fields of knowledge?

The Environmental Humanities and the Current Socioecological Crisis

Marco Armiero

Abstract

We live in a manifold crisis. Scientists are urging us to act upon climate change, attempting to affect the state policies and the behavior of ordinary people. The ecological crisis is intertwined with a vast array of social problems, including the escalation of violent conflicts, austerity, and international tensions. Xenophobia, populism, and even fascist nostalgia seem to be the only answers to the anxieties of the people who have been hit most by wild globalization and merciless neoliberalism. It is not by chance that all this has occurred in a cultural climate dominated by post-fact rhetoric, fake news, and a fierce attack on intellectuals. The dismantling of critical thinking, the imposition of simplistic discourse, and the erasure of collective memories are crucial ingredients for the making of docile and manipulable subjects. It has been said that in order to tackle such complex crises, experts must be mobilized; proper knowledge should replace strange beliefs; rational solutions have to be proposed. Academic knowledge is called upon to demonstrate its societal value. While abandoning the ivory tower and engaging with the challenges of the present are healthy exercises, the expertification of the crisis can lead to the depoliticization of its causes and to solution-oriented research. Of course, researchers should contribute to finding solutions to collective problems but sometimes they must also be the trouble rather than the solution. In other words, they must help to reframe issues, question solutions, challenge overarching assumptions, and imagine alternatives. The environmental humanities (EH) are especially well suited to accomplish this mission. According to Iovino and Oppermann, the EH were born with the ambition to bring “the social sciences, the humanities, and the natural sciences together in diverse ways to address the current ecological crises.”

In this paper, I will present the EH as an experiment in a new kind of humanities scholarship. I will illustrate the ways in which the EH are challenging the traditional organization of research and teaching. I will then discuss the possible contribution of the EH to multidisciplinary

(undisciplined?) training and research programmes. Finally, I will elaborate on the public utility of the EH and the possibilities they offer for engaging with actors beyond academia.

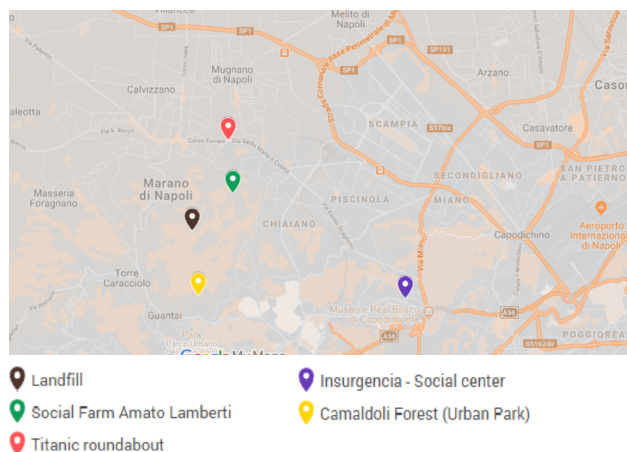
Maps of knowledge, knowledge on maps

Look at a map of a campus, any campus in the world. That map not only serves to guide people so they do not get lost in the labyrinth of streets and buildings that form our universities. That map also organizes the ways in which we move around the wider world. There is the Humanities corner, the Life Science building, the School of Economics, engineering labs (and much more). If you are lost and try to ask for information, it will become clear that students never cross the frontiers of their place on the map. Generally, they spend their university years moving around the same buildings; the rest of the map remains terra incognita for them. The problem is that that map also reveals the way we look at the world through distinct disciplines. Humanities do not mix with life sciences and economists can dance with the wolves, safe in the knowledge that no one is watching them.

To be fair, these kinds of maps are not a prerogative of universities. The maps produced by corporations for their pipelines, mines and highways are also telling examples of highly sectorial knowledge. They may be perfect from a geological point of view but are completely blind to other dimensions of the lands they should represent. As political scientist James Scott has brilliantly argued, maps are tools for the imposition of power designed to simplify the complex socioecological entanglement of reality. Not only do they clearly separate the forest from the village but they also separate the knowledge through which we know about the forest from that which we use to understand the village. This should not come as a surprise since they do the same thing as university maps when they serve as the

matrix for organizing our experience of space and knowledge. As Scott clearly argues, the performative power of that map resides “not in the map, of course, but rather in the power possessed by those who deploy the perspective of that particular map” (Scott 1998, 87).

Figure 1: Chiaiano neighborhood, Naples (Italy)
(Produced by the author from GoogleMaps)



Maps, instead, can be - should be - more complicated. Figure 1 is a map of a working-class neighborhood on the outskirts of Naples (Italy) which I used during my research on waste and struggles for environmental justice. To draw and interpret that map we need a plurality of knowledge and even more an attitude to move among disciplines rather than be stuck forever on one side of the disciplinary border. The landfill and the forest, the social center and the Titanic roundabout, only a few of the gravitational centers in the geography of that neighborhood, cannot be viewed in isolation by an environmental engineer, a forester, a sociologist or an urban planner. They acquire new meanings when placed on that map, meanings created by the relationships connecting them through space, time, emotions, memories and practices.

Where the weird things are

Fortunately, things are changing. In the last few years, there has been a boom in hybrid, post-disciplinary environments emerging everywhere at universities. The humanities have been at the forefront of this hybridization by combining with other disciplines in new fields, such as the medical humanities, the geo-humanities, the digital humanities, and the environmental human-

ities. Thus far the latter has perhaps been the more successful and promising innovation, leading to a proliferation of academic experiences, sometimes forcing changes to the usual settings of the humanities, assuming the forms of observatories, laboratories and hubs. New journals and book series have been dedicated to environmental humanities.

Although the definitions, and even more the practices, of this new field are still in the making, we can provide some basic information about what the field entails. It clearly includes all the humanities disciplines that engage with the environment, such as ecocriticism, environmental history, environmental philosophy, arts, film studies, and others. Instead of viewing it as a new academic discipline, I envision the environmental humanities as a multidisciplinary field, wherein scholars from various disciplines converge, often with a strong commitment to the environmental challenges of the present. As Serenella Iovino and Serpil Opperman have written in an introductory volume to the environmental humanities, “[this new field] brings the social sciences, the humanities, and the natural sciences together in diverse ways to address the current ecological crises from closely knit ethical, cultural, philosophical, political, social, and biological perspectives” (Iovino and Opperman 2017, 1). Historian Sverker Sörlin has employed environmental humanities as the prototype for what he has called integrative humanities, arguing that “these are humanities with a cause, self-identifying as part of a transformation agenda with a proactive view of the role of the humanities” (2018, 94).

The Environmental Humanities Laboratory (hereafter EHL) at the KTH Royal Institute of Technology in Stockholm is part of this new reconfiguration of the humanities in combination with environmental concerns and scientific knowledge. The EHL has adopted the slogan “undisciplining the humanities since 2011;” but why “undisciplining”? Evidently, this is a motto and I should not attempt to transform it into a methodology or an elaborate theory. Nonetheless, speaking of “undiscipline” is a gesture intended to signal a vexation in the usual way to produce knowledge while acknowledging the limits of disciplines (often rooted in a construction of knowledge that has been colonial, patriarchal, racist, classist, heteronormative etc.). Paraphrasing John Holloway (2010), I argue that the EHL’s undisciplined posture reassembles a “no” which is in itself is a search for an alternative.

Case 1 — Environmental Humanities Laboratory (EHL), KTH Royal Institute of Technology, Sweden

The foundation of the laboratory in 2011 was a deliberate effort to link the academic work done in the Department to an agenda for sustainability and societal challenges and contribute to the transformation of humanities in Sweden and beyond. In terms of its funding structure, the EHL proves the potentialities of the environmental humanities; the creation of the Lab was possible thanks to a generous donation from industrialist Carl Bennet, which was matched by internal KTH funds. Since then, the EHL has attracted about four million euros from various funding agencies. The label “laboratory” is used to underline the experimental nature of this initiative as well as its hands-on approach. From filmmaking as a research practice to toxic storytelling as public environmental humanities, the EHL has produced a creative array of projects, always deeply embedded in collaborations beyond academia.

For more information about the EHL, visit <https://www.kth.se/en/abe/inst/philhist/historia/ehl>

Case 2 — Humanities for the Environment Observatories (HfE)

With eight observatories involved, distributed among 40 universities around the world, the HfE is a global player in the new field of the environmental humanities. It started with a generous donation from the Andrew W. Mellon Foundation. Again, the use of the “observatory” concept signals the desire to go beyond the usual academic setting of the humanities. The HfE initiative also has a clear commitment to socially relevant research. As stated on their website, they wish to produce humanities knowledge that can “guide global and local decision-makers.” Building upon the assumption that humans are indeed affecting the geo-bio-chemical cycles of the planet, the HfE observatories have a clear policy-oriented aim, which is “to identify, explore, and demonstrate

the contributions that humanistic and artistic disciplines make to solving global social and environmental challenges”. The observatories’ work is embedded in eight research projects touching upon dissemination, digital humanities, hopes, and life in the sea.

For more information about the HfE, visit <https://hfe-observatories.org/>

Case 3 — Rachel Carson Center for Society and the Environment (RCC), Germany

The RCC was founded in 2009 thanks to a large grant from the German Federal Ministry of Education and Research. It is the result of a joint effort between Munich’s Ludwig-Maximilians-Universität and the Deutsches Museum. This collaboration between a university and a museum has left its creative imprint on the RCC, which in fact has included among its activities online virtual exhibitions. Although born primarily as an environmental history center, the RCC has now evolved into an “interdisciplinary center for research and education in the environmental humanities and social sciences.” The RCC also emphasizes its commitment to contributing to public debates about both past and future environmental challenges. “Transformations in environment and society” is RCC’s overarching research theme. As stated on its website, it provides the right lens to explore “a vast range of changes—from the quick adjustments in human behavior that interest sociologists to the gradual changes over millennia that are central for geologists and climatologists, and of course the short- and long-term shifts that fascinate historians and philosophers.”

For more information about the RCC, visit <https://www.carsoncenter.uni-muenchen.de/index.html>

What can the environmental humanities do? Good practices for gentle experiments

Given the contemporary planetary crisis, the combination of humanities and the environment seems extremely appealing. While venerable institutions like the MIT have always cultivated a fairly strong humanities tradition that is embedded into technical and scientific curricula, new experiments are appearing on the horizon, such as, for instance, The London Interdisciplinary School with its Bachelor in Arts and Science. It has been argued that the environmental humanities could also be called “sustainable humanities” (Griffiths 2007; LeMenager and Foote 2012). The invention of the environmental humanities and their convergence with sustainability studies/discourses seems a blessing for disciplines that were destined for irrelevance if not extinction. This new post-disciplinary platform has enabled humanities scholars to access funding schemes that were generally off their radar before. Sometimes, research projects engaging with the Sustainable Development Goals include portions that are somehow related to the humanities. It is not uncommon to find projects in the environmental humanities funded by private donors. Environmental humanities scholars or centers are often part of the university’s initiatives to promote sustainability on campus. In some cases, environmental humanities scholars have been invited to play a more active role in advising on policy (such as, for instance, EHL’s member Professor Sverker Sörlin who is part of the Swedish advisory board for climate change). Therefore, one can say that the environmental humanities are the kind of knowledge we need in these complicated times; it is a success story that demonstrates how disciplines can be renewed by choosing to listen to the anxieties of the present.

Although I believe that this is mostly the case, I would like to look in greater depth at the challenges of the environmental humanities. In a simple and direct way, I would like to ask whether the environmental humanities are just a shortcut for old-fashioned disciplines to be revamped and get more in tune with contemporary problems, or whether they can actually change both the disciplines and the ways in which problems are framed.

Let’s start with the very concept of sustainability. While I appreciate that humanities scholars have started to

Figure 2: Environmental Humanities Laboratory, Stockholm (EHL’s theme, produced by Jesse Peterson)



engage with sustainability, I also think it would be better for them not to stop doing what they know best, i.e. exercising their critical thinking. Engaging with sustainability should mean rethinking what sustainability is, rather than simply reproducing mainstream discourses. The tracking of historical and conceptual genealogies, analysis of the political uses of discourses, and asking who wins and who loses is the daily bread of humanities scholars and can change the ways in which sustainability is framed. This is crucial, for instance, when the environmental humanities are co-opted in hands-on initiatives, such as those aimed at greening universities. Making individual scholars aware of the consequences of their travels is nowadays a recurrent trope in discourses on how to make universities more sustainable. Without a doubt, individual commitment is an important issue in building a more sustainable society; nonetheless, focusing only on individual responsibility is at best suspicious. If universities want to be sustainable, I believe that someone needs to ask them to divest from fossil fuels and rethink their partnership with the corporations that are so deeply involved in the current ecological crisis. Radical changes need to be made to universities’ curricula in order to change the ways in which we build our infrastructures, understand public health, manage companies, think of economics, and write our histories. Otherwise, as scholars, we may run the risk of reducing our air travel but still teaching students business-as-usual knowledge. I believe that the call for such changes is what environmental humanities scholars can offer in order to make universities greener.

Engaging with sustainability should mean rethinking what sustainability is, rather than simply reproducing mainstream discourses.

Environmental humanities scholars are good with narratives when they are not completely trapped in incompressible jargon. Some might say that their main role should be that of translators: hard scientists produce knowledge and humanities scholars find the ways to make it intelligible to the public. Though this might well be a possible collaboration, I believe the environmental humanities should be more ambitious. They should aim to be part of the entire design of the research project by helping to determine the ways in which scientific knowledge is produced. I could mention here research in the field of environmental justice- the study of the unequal distribution of environmental damage and benefits. An exploration of environmental justice implies recognition of the plurality of subjects that produce knowledge, the conflict between different regimes of truth, and the need to mobilize various methodological tools in order to dig into the intricacies of socioecological issues. From toxic storytelling to popular epidemiology, from urban planning to chemistry, environmental justice is one of those fields where post-disciplinary knowledge is not only highly needed but shaped in the very practices.

Finally, indeed, environmental humanities are fashionable, which means research in the field can even be fundable. For those who know how difficult it is to find support for humanities research, this will not seem a trivial problem at all. While I do not share a certain snobbish attitude that theorizes the need to keep scientific research and funding issues separate, I still believe that humanities scholars – perhaps more than others who are more familiar with the funding game – should contribute by bringing ethical and power issues to the forefront. This means, of course, evaluating what kind of sponsorship is appropriate to accept, but also being self-reflexive about the kind of consequences that the grant seeking game might bring with it. While on the ground, heavy reliance on external funds risks transforming departments into sweatshops with a high rate of precarious researchers and a very small number of tenured professors – with a risky power imbalance -, scientifically speaking, this often infringes on the freedom to set up independent research agendas. When looking for funds, it is not rare for researchers to censure themselves, designing research proposals that they believe are easily fundable.

Case 4 — The Cabinet of Curiosities Slam and Exhibition

In February 2014 the Center for Culture, History and the Environment (CHE), in collaboration with the Rachel Carson Center and the KTH Environmental Humanities Laboratory, organized an Anthropocene Slam, inviting contributors to propose objects that could help us to “rethink humanity’s relationship to time, place, and the agency of things that shape planetary change” (from the Slam’s call for objects). In the spirit of the poetry slam, each presenter had to pitch the object to the audience in order to be selected as part of an exhibition for the Deutsches Museum.

I have proposed the Cabinet of Curiosities project as an inspirational example of what a non-disciplinary environmental humanities project might be (Armiero 2017). It mobilized scholars, writers, and artists far beyond any narrow disciplinary and even academic border. The unusual setting unleashed the creativity of the presenters by producing an intellectually engaging, but nonetheless entertaining public event. “Evidently, it crossed disciplines to become an arena for environmental humanities; it had the ambition to speak beyond the scholarly circle, experimenting with unusual languages and tools; it aims to intervene in current debates, reclaiming the political aspect of the humanities without renouncing poetry, playfulness, and humor” (Armiero 2017, 56-57). The Anthropocene Slam is also a perfect example of how the environmental humanities experiment with a plurality of languages and venues; in fact, it produced a public event (The Slam per se), a digital and museum exhibition, and a publication (Mitman, Armiero, and Emmett 2018). It also generated major interest around the world, with other institutions replicating similar formats, such as The University of Queensland in Australia and the Environmental Humanities Switzerland in Zurich.

For more information about the Anthropocene Cabinet of Curiosities Slam, visit <https://nelson.wisc.edu/che/anthroslam/>

Case 5 — The Toxic Bios project

Toxic Bios is a public environmental humanities project developed by the EHL, which aims to co-produce and/or uncover stories of contamination and resistance. Adopting an autobiographical approach, the project has collected around 60 individual stories from people around Europe who claim to be affected by contamination in their communities. Toxic Bios is rooted in the scholarly tradition of co-research and action-research, rejecting the binary opposition of experts vs. the public while actively undisciplining the space for the production and legitimization of knowledge. The project is a good example of how the environmental humanities can engage with the public not only through outreaching but also through co-designing of research. Toxic Bios proves the possibility to employ the environmental humanities' mastery of narratives and storytelling as both research methodologies and transformative interventions in society. Toxic Bios claims to be a guerrilla narrative project, this expression referring to its commitment to producing counter-hegemonic storytelling aimed at dismantling – or at least revealing – the toxic narratives that silence or normalize socioenvironmental injustice. Tackling the symbolic violence of toxic narratives, by exposing stories of contamination that are hidden from public view, or countering the official denial of contamination risk and damage, is the first, fundamental step towards doing “environmental justice”, i.e. addressing environmental violence and soliciting the appropriate public intervention (Armiero et al. 2019).

To learn more about the Toxic Bios project, visit www.toxicbios.eu

A Decalogue for socially committed environmental humanities

1. Being relevant does not mean embracing all the buzzwords and policy jargon thrown at us but does imply doing research while keeping in mind the challenges that society is facing.
2. An environmental humanities scholar should not stop being a humanities scholar in order to be relevant.
3. Leaving the ivory tower of academia is an important step, but one must also decide where to go when on the other side of the academic wall. A big corporation and a grassroots organization are both outside the ivory tower. Where will we go?
4. The urgency to do something useful does not mean we should stop asking fundamental questions such as: what is useful? Who decides what is useful? And useful for whom or what? What might be a viable alternative to what is obviously useful?
5. A speech, a novel, a photograph, a song, a poem or a piece of art have often had an extraordinary impact. The fact that the current neo-liberal academic system does not know how to measure such a concept does not make it irrelevant.
6. Aiming to be funded should not imply self-censorship. Extreme times require radical thinking.
7. The production of knowledge for social transformation is a powerful driving force but scholars should not forget that most transformations are occurring in society without their intervention. Humility and the desire to contribute must go hand in hand.
8. Environmental humanities scholars should look to change their research and teaching practices. A syllabus written only by white males, for instance, will not deliver any transformative message.
9. Committed environmental humanities scholars should be curious to explore new languages in order to communicate their research.
10. There are many contradictions that environmental humanities scholars need to face while working on alternatives, including the hierarchies of knowledge production that privilege the Global North's academic paths; the commodification of knowledge; bibliometric

measurements; and an absolute devaluation of certain activities such as teaching and outreaching. For this reason, they should master the canon in order to find ways to break free from it.

References

- Armiero, Marco et al. (2019). Toxic Bios: Toxic Autobiographies—A Public Environmental Humanities Project. *Environmental Justice* 12 (1), available online at <https://www.liebertpub.com/doi/full/10.1089/env.2018.0019>
- Armiero, Marco. (2017). Environmental History between Institutionalization and Revolution: A Short Commentary with Two Sites and One Experiment. In *Environmental Humanities. Voices from the Anthropocene*, eds. Serenella Iovino and Serpil Oppermann. London: Rowman and Littlefield International, 45-60.
- Griffiths, Tom. (2017). The Humanities and an Environmentally Sustainable Australia. *Australian Humanities Review* 43, available at <http://australianhumanitiesreview.org/2007/03/01/the-humanities-and-an-environmentally-sustainable-australia/>
- Holloway, John. (2010). *Change the World Without Taking Power*. London – New York: Pluto press.
- Iovino, Serenella and Oppermann, Serpil. (2017). *Environmental Humanities. Voices from the Anthropocene*. London: Rowman and Littlefield International
- LeMenager, Stephanie and Foote, Stephanie. (2012). The Sustainable Humanities. *PMLA* 127(3): 572–578
- Mitman, Gregg, Armiero, Marco, and Emmett, Robert. *Future Remains. A Cabinet of Curiosities for the Anthropocene*. Chicago: Chicago University press.
- Scott, James. (1998). *Seeing Like State. How Certain Schemes to Improve the Human Condition Have Failed*. New Haven: Yale University Press.
- Sörlin, Sverker. (2018). Humanities of Transformation: From Crisis and Critique Towards the Emerging Integrative Humanities. *Research Evaluation* 27(4): 287-297.

21. How can the Sustainable Development Goals (SDGs) be developed in the different fields of knowledge?

Optimizing the Space for the Development of the Sustainable Development Goals (SDGs) in the Different Fields of Knowledge

Akpezi Ogbuigwe

Abstract

The Sustainable Development Goals (SDGs) are about just, peaceful and sustainable societies, and the future. They are about people, planet, property, peace and partnership (Transforming our World, 2015). In order for the SDGs wish list to come true, it must metamorphose from mere ambitious and politically correct statements to meaningful targets backed with strong resolve. This would need to be exemplified by intentional and purposeful planning, system transformation and continuous learning and research to drive daily and sustained actions and decision making. The Brundtland Commission defined Sustainable Development as development that seeks to meet present needs without compromising the ability of future generations to meet theirs. Inherent in this definition is the acknowledgement that the present generation has the responsibility not to use up, destroy or pollute our commonwealth, nor to make our world unliveable, ungovernable and insecure for both present and future generations. Though governments, businesses, and other stakeholders are vital in the implementation of the SDGs, higher education institutions (HEIs) are indispensable. Through their core business of teaching, research, and community development, they can generate and advance new areas of research and learning in each field of knowledge targeting the SDGs. They will need to go beyond the commendable steps of greening curriculums, buildings and campuses, to producing a generation that possesses the foundations for strong sustainability (Clugston & Calder 2014), innovation and ethics - embracing the head, heart and hands in realizing the future we want (Ogbuigwe 2018).

This article looks at the concept of sustainability and its place in the development of a new discourse in knowledge advancement and interdisciplinary collaboration. It examines the SDGs and their relevance in the Anthropocene epoch. It highlights institutional, curricular and pedagogical approaches that entrench sustainability, cementing the ethical foundation that necessarily goes

along with it. The article concludes by revisiting the case study by the United Nations Environment (UNE) programme on Mainstreaming Environment and Sustainability in African Universities (MESA) and draws lessons from the programme for the continued development of the concept of sustainability explicit in all the SDGs in the different fields of knowledge.

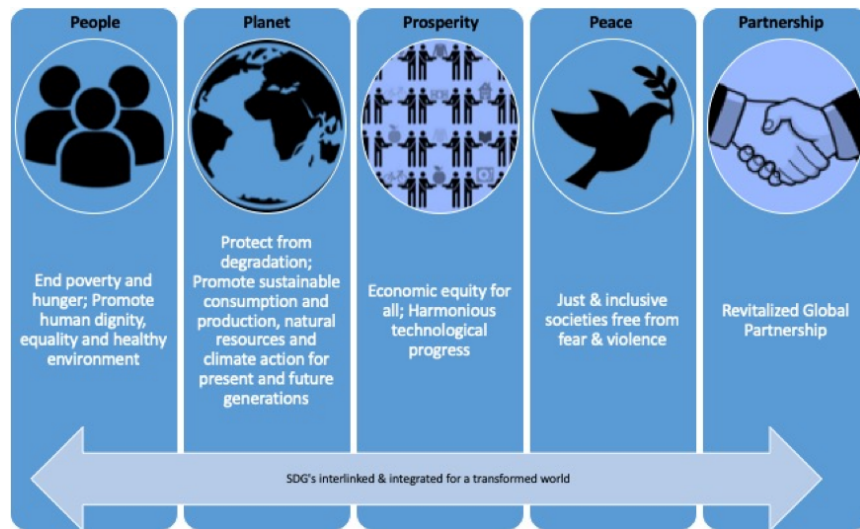
The Sustainable Development Goals and their Relevance in the Anthropogenic Age

The 17 SDGs, otherwise known as the Global Goals, are an urgent call for action by all countries - developed and developing - in a global partnership to bring an end to the ravages of poverty, safeguard the planet and ensure that all people enjoy peace and prosperity. The goals recognize that ending poverty and other deficiencies in society must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth –while tackling environmental challenges and sustaining natural resources.⁽¹⁾

There is no assurance that the SDGs will be more successful than their precursors, the Millennium Development Goals (MDGs). However, the SDGs can become important proactive steps in the quest to change the existing world view on human development and at the same time generate action for the eradication of poverty, enhancement of socio-economic standards, improvement of ecological balance, and a springboard for exploring the ethical foundations that will lead to peaceful, cohesive and sustainable societies. This ‘chance’ or ‘elbow room’ is desperately needed in this anthropogenic age; and higher education through its various disciplines can provide the space.

1. United Nations Sustainable Development Goals (SDGs). See: <https://sustainabledevelopment.un.org/?menu=1300>

Figure 1. SDGs interlinked and integrated for a transformed world



Writing on this compelling challenge faced by higher education, Sterling, quoting from Parkin, (2013, p. xviii) asked “will universities offer the intellectual leadership needed to shift our civilisation off its self-destructive course and on track for a sustainable future? Obviously, they can, if they so choose” (Sterling 2014).

SDGs can become important proactive steps in the quest to change the existing world view on human development and at the same time generate action for the eradication of poverty, enhancement of socio-economic standards, improvement of ecological balance, and a springboard for exploring the ethical foundations that will lead to peaceful, cohesive and sustainable societies

Sustainability in Disciplinary Development and Interdisciplinary Collaboration

Several leading thinkers have categorized sustainability as a meta-discipline (in the sense that it transcends several disciplines) (Fernandes & Rauen 2016). Although the multifaceted nature of sustainability has been acknowledged, there is still a challenge regarding consensus as to how social, economic and environmental development interlink. Some theorists suggest that it is possible to combine high economic growth with environmental and social sustainability. Those of a contrary

opinion assert that it is impossible to combine economic development with environmental and social sustainability (Bäcklund 2014), and that we cannot choose the path of unbridled economic growth and consumption and also reach sustainability.

Considering these disparities, the development of knowledge on sustainability can help to guide knowledge development in other disciplines towards addressing the SDGs. Interdisciplinary approach entails the use and integration of techniques and analytical frameworks from multiple academic disciplines to examine a theme or an issue. It employs multi-disciplinary approaches to examine topics but takes a step further by: taking insights from many other relevant disciplines, blending their contribution to understanding, and then integrating these suggestions into a comprehensive, and cohesive, framework of analysis. The cross-disciplinary approach necessitates the emergence of diversity in the content. Such an approach is required to structure sustainability problems in such a way as to confer treatability and comprehension, both in depth and diversity. This can be attained by equipping leaders and learners with the skills to identify challenges, craft cost-effective solutions, design and implement strategic interventions, communicate effectively, and work collaboratively to solve problems. Always bearing in mind the words of Orr, (2004, p.6) as quoted in Wals & Blewitt (2010)

“Conventional wisdom holds that all education is good, and the more of it one has, the better...The truth is that without significant precautions, (it) can equip people merely to be more effective vandals of the Earth”.

Developing Sustainable Development in Various Fields of Knowledge

The SDGs do provide an opportunity for the further development of the concept of sustainability, firmly entrenched in the goals, in the different fields of knowledge and academic disciplines. SDG target 4(7) provides that *“By 2030, ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyle, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of cultures’ contribution to sustainable development.”* The International Commission on Education for Sustainable Development Practice asserts that it is essential to build a comprehensive new system of professional education anchored in a practical, cross-disciplinary approach to enhance continuous learning of professionals in order to anchor sustainability. (DeGioia et al. 2008)

The commission provided various recommendations to enhance the development of sustainability knowledge in various fields. One of the recommendations was the development of Generalist Sustainable Practitioners *“who would have the capacity to navigate across the intellectual and institutional silos of specialized disciplines to develop integrated policy and curriculum solutions that are scientifically, politically and contextually grounded in sustainability.”* (DeGioia et al. 2008)

It is essential to build a comprehensive new system of professional education anchored in a practical, cross-disciplinary approach to enhance continuous learning of professionals in order to anchor sustainability

With regards to pedagogy, it is acknowledged that conventional pedagogical methods at undergraduate levels often focus on information delivery and communication of factual knowledge through lectures and problem sets. However, this approach, according to Hardin et al. (2016) is ill-equipped to support the development of core competencies for sustainability and creates gaps that deny students the opportunities for systematic and cross-disciplinary learning. To address this, Hardin et al., (2016) proposed the adoption and application of a tried and tested pedagogical approach - the case-meth-

od - to imparting sustainability knowledge in different knowledge spheres. When suitably re-engineered, the case method has the potential to equip learners with the skills to meet and address the challenges represented by the complexity of sustainability conundrums (Hardin et al. 2016).

To address the lack of appropriate training programs for sustainability, Hardin et al. (2016) proposed the development of sustainability courses, which respond to the needs of students and learners, who will be making decisions to solve sustainability challenges. However, the development of programs is not enough on its own. Institutions have to put some effort into promoting sustainability to their students and to foster socialization so that the main stakeholders – the students - can excitedly take up issues of sustainability (Ulkhay, Wijayanti, Wiganingrum, Dewi, & Ardi, 2018). In addition, the enhancement of global learning resources, including global courses, web-based collaborative opportunities, contextualised learning in each discipline and the establishment of programs that equip graduates with the requisite skills and competencies to tackle the issues of sustainability (DeGioia et al. 2008). UNESCO (2014) propagates education for sustainable development to empower *‘learners of any age, in any education setting, to transform themselves and the society they live in.’* Wim De Villiers, Rector of the Stellenbosch University in South Africa when assessing the role of African Universities in propagating the Sustainable Development Goals⁽²⁾, reiterated that African Universities will have to undergo curricular changes in order to bring focus to the SDGs. Universities will need to consider how sustainability gets incorporated into the curricula and how they conduct teaching, research and engagement with communities⁽³⁾. This brings to fore the United Nations Environment (UNE) programme on mainstreaming environment and sustainability in African universities.

Walking the Talk in the UNE: Mainstreaming

2. On 25 September 2015, the United Nations General Assembly formally adopted the universal, integrated and transformative 2030 Agenda for Sustainable Development, along with a set of 17 Sustainable Development Goals and 169 associated targets. Goal 13 stipulates: *Take urgent action to combat climate change and its impacts*

3. See: <https://theconversation.com/sustainable-development-goals-are-in-reach-if-african-universities-work-together-47903>

Environment and Sustainability in African Universities Programme (MESA)

The MESA Programme was an initiative by the United Nations Environment (UNE) to enhance collaboration with African universities in support of the UN Decade of Education for Sustainable Development (UNDESD). Popularly known as MESA, the programme garnered membership from over 85 universities in Africa spanning over 30 countries, with the intention of developing environmental and sustainability perspectives within teaching, research, community engagement and administration. This is in line with the submission by the Sustainable Development Goals Centre for Africa (SDGCA) that it was important to bring in the ideas of concrete as opposed to abstract learning at African universities. The MESA programme also targeted the engagement and improvement of student participation in sustainability activities both within and beyond universities. The reform of research processes and curricula was another prime focus (Lotz-Sisitka 2015).

Lessons learnt from the MESA Programme

In a review of the MESA program titled “*Stories of Change*,” (Lotz-Sisitka 2015) key drivers of the program

document the experiences of different universities, the outcomes, and the lessons learned. The MESA program was highly successful and offered several learning opportunities for faculty members and students in terms of higher education and environmental sustainability. Lessons were drawn from both challenges and successes. Some of the key lessons HEI can garner from the MESA experience in developing the SDGs in the different field of knowledge are as follows:

Institutional Change and Incorporation of New Content Could be a Slow and, on many Occasions, a Difficult Process

HEIs are complex organizations with complex organizational structures and several bureaucratic processes. One of the lessons learnt from the MESA program was the challenge of dealing with inflexible university systems such as program development and acceptance; staff involvement and change of attitude; and funding procedures, at least at the nascent stages of the programme, to ensure that as many disciplines, and lecturers were covered.

Similar challenges are almost inevitable when taking strides to entrench and develop the SDGs within varied fields of knowledge. At the University of Buea in Cameroon, guidelines were adopted to conceive ways of implanting sustainability into their degree programmes. They launched an ongoing revision of existing university syllabi to include education for sustainable development as key objectives in all degree programmes.

Figure 2. MESA Hotspots



Collaboration Impacts Course Development

One of the major successes of the MESA program was the development of various courses and innovative new teaching methods. For instance, as an outcome of the MESA program, the Department of Chemistry at the University of Nairobi (UoN) reviewed their syllabus for the first time in two decades in order to reorient their content to contribute to the sustainable development objectives of Kenya. The department also wanted their revised courses to respond to emerging developmental needs and challenges. They targeted the supply of well-trained manpower that will provide the necessary inputs to enable policy makers to present a strong case at international fora on issues touching on the Environment (Naituli, 2011).

Another major feature of the MESA programme in this regard was the promotion of interdisciplinarity. This led to interaction with isolated disciplines to enable them and other fields of knowledge to reconnect to society and the needs therein. Such bridge building between disciplines led to the unravelling of complexities and established connections between phenomena that are seldom detected within disciplinary myopia. Interdisciplinarity created better comprehension of the object of knowledge, and knowledge of sustainability paved the way for a deconstruction of traditional knowledge structures to enable reformulation and a fresh understanding of societal issues. The Kenyatta University, Kenya, implemented an interdisciplinary course on environmental and sustainable development issues at the undergraduate and postgraduate levels; all student projects and research were to have a component of environmental and sustainable development issues.

Interdisciplinarity created better comprehension of the object of knowledge, and knowledge of sustainability paved the way for a deconstruction of traditional knowledge structures to enable reformulation and a fresh understanding of societal issues

There were also several cases of Masters and PHD theses on environment and sustainability (Chiotha 2010), (Togo and Lots-Sisitka 2013); new programmes and action research (Togo 2009), as well as several publications on the programme (Wals 2010), (Tilbury 2011) Caeiro et al. 2013), (Sterling, Jones and Selby 2010), (Manteaw, 2012). These directly and indirectly contributed to the development of the concept of sustainability in the various fields and institutions.

Sustainability Programs Impact Individuals, Institutions and Communities

There was evidence to show that the MESA project contributed to the professional development and confidence of university lecturers involved in mainstreaming environment and sustainability issues into a variety of higher education programmes. Institutions experienced an increase in networking at local, national and international level. Participating staff were rejuvenated and showed a renewed commitment to articulating environmental issues and doing community centred research.

The MESA program exemplified the fact that university programs involving the exploration of sustainability issues have a direct impact on communities and their daily lives. For instance, the University of Goma reported lower frequencies of intestinal worms as a result of their research into the environment and health. The University of Malawi reported success with a mushroom production research programme and farmer training for diversification of livelihoods. The University of Eswatini reported community level outcomes related to soil management, water pollution, poverty alleviation, and mitigation of vegetation depletion, among others.

Participatory Approach Enhances Contribution and Success

As the MESA programme wound up, the impacts were mainly visible at the level of individual professional development, and course and programme development levels. Also, at broader national and sub-regional levels there were indicators of impact at community level. Of significant importance was the adoption by MESA of a participatory strategy, the purpose of which was to bolster social mobilization at a local level. Through this approach, MESA was able to support and embolden collective management of university-driven processes for sustainability. The MESA open process promoted ownership by both partners and participants, which led to a variety of positive results in different contexts.

Leverage on Technology to Establish Knowledge Exchange Centres

The MESA program established a follow-up mechanism to communicate with the MESA network and monitor progress regularly. An online community was subsequently set up, established by the Global Virtual University, and a follow up review was undertaken of all MESA course participants to monitor progress. The

review showed that one of the anchors of success for the MESA program was seamless communication and free exchange of knowledge (Naituli, 2011).

Continuing Impact of the MESA Programme

MESA has contributed to the pool of professionals working in the field of education for sustainable development, and the SDGs. The participating universities have continued to collaborate through bodies like the African Association of Universities, the United Nations University Regional Centres of Expertise, and other national, sub-regional, regional, and global networks. Not all these changes are visible at every participating university. In some cases, the visibility of the impact is campus-wide whilst in others only a small cluster of these changes are visible. However, the collective 'capital' that is being developed across the different universities is serving to expand knowledge of ESD, and the many different facets of mainstreaming environment and sustainability into different fields of knowledge.

there and is what propels continued investigation into our life on earth and that of future generations. There is an urgent need today to challenge every discipline with more concrete and contextualised learning.

Indeed, learning about, from, with and for sustainability within each discipline will expand the horizons of each of them into the realms of transformation, relationships with rights, ethics, ecological integrity, social and economic justice, democracy, nonviolence and peace (Corcoran, 2019). This process will engage our head, hearts and hands in translating the SDGs to action

Developing knowledge in sustainability in every discipline means nurturing innovative decision makers that employ available knowledge to think systematically, conceive how human and natural processes interact across temporal, territorial, and social scales, and craft solutions drawing upon insights from multiple relevant disciplines and fields of knowledge.

By advancing the SDGs, the world explores opportunities to eradicate poverty, enhance socio-economic standards, improve the ecological balance, and invest in peaceful, cohesive and sustainable societies. Therefore, it is essential to continue to encourage this comprehensive new system of education anchored in a practical, ethical, cross-disciplinary approach to enhance continuous learning in order to anchor sustainability.

Finally, in exploring ways to develop the SDG's in different fields of knowledge, we must consider that it does not take new goals to achieve sustainability. It takes deeper dimensions of thought processes (cognitive), unfeigned feelings/ethics (some would say socio-emotional), and new action (head, heart and hand). The same mind-set, systems, lifestyle, political priorities and choices that created the problems we intend desperately to flee from cannot resolve them. Humans cannot consistently choose the path of failure nor educate for failure and expect to arrive at *uhuru*.

Conclusion

The redefinition of development to embrace economic, social, and environmental perspectives and sustainable development as meaning "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Our Common Future, 1987) (referred to above) has indeed started a disruptive process of rethinking the way we learn, live and do business. That singular definition of sustainable development influenced the thrust of international conventions, national laws, business regimes, education and ideologies. It has proven that the interconnected development of knowledge in various disciplines is related to human advancement and can significantly influence the way we act and behave in response to the universe. The SDGs provide expanded scope for embedding the concept of sustainability in the various fields of knowledge and offers the opportunity for continuous exploration and learning *about, from, with and for* (Corcoran 2002) the achievement of our shared values and our common future aspiration as targeted in the SDGs. According to Fadeeva (2013), there is 'a need to be able to integrate capacities, across disciplines and other dimensions, to be able to respond to opportunities that arise that might not have been predicted'. This need has always been there, will always be

References

- Bäcklund, A. (2014). *Philosophical perspectives on sustainable development with a focus on the urban poor*. KTH Royal Institute of Technology, Stockholm, Sweden.
- Bonney, K. M. (2015). Case Study Teaching Method Improves Student Performance and Perceptions of Learning Gains. *Journal of Microbiology and Biology Education*, 16(1), 21–28. <https://doi.org/10.1128/jmbe.v16i1.846>
- Busco, C., Frigo, M. L., Riccaboni, A., & Quattrone, P. (2013). Integrated Reporting: Concepts and Cases that Redefine Corporate Accountability. *Integrated Reporting: Concepts and Cases That Redefine Corporate Accountability*, (2010), 1–350. <https://doi.org/10.1007/978-3-319-02168-3>.
- Caeiro, S., Filho, W., Jabbour, C., Azeireiro, U. (eds). (2013). *Sustainability Assessment Tools in Higher Education Institutions*. Springer, Cham.
- Chiotha, S. (2010). Mainstreaming Environment and Sustainability: an analysis of a master's in environmental science and a tree-planting project at chancellor \ collage, University of Malawi, *International Review of Education*, 56 (2-3), 287-298.
- Clugston, R., & Calder, W. (2014). *Intergenerational Learning and Transformative Leadership for Sustainable Futures*, ed by Corcoran, P. B., & Hollingshead, B. P. Wageningen Academic Publishers. 113-125.
- Corcoran, P. B. (2002). The Values of the Earth Charter in Education for Sustainable Development. *Australian journal of Environmental Education*, vol. 18, pp. 77-80.
- DeGioia, J., Gayle, H., Haddad, L., Kim, J., Koplan, J., Kwesiga, F., ... Zedillo, E. (2008). Report from the International Commission on Education for Sustainable Development Practice, (October), 100.
- Fadeeva, Z. (2013). *Towards more Sustainable Consumption and Production Systems and Sustainable Livelihoods*. UNU-IAS.
- Fernandes, V., & Rauen, W. B. (2016). Sustainability: an interdisciplinary field. *Fronteiras: Journal of Social, Technological and Environmental Science*, 5(3), 188. <https://doi.org/10.21664/2238-8869.2016v5i3.p188-204>
- Folkesson, E. (2013). Human Rights Courts Interpreting Sustainable Development : Balancing Individual Rights and the Collective Interest. *Erasmus Law Review*, 6(2), 142–154.
- Lotz-Sisitka, H., Naituli, G., Hlengwa, A., Ward, M., Salami, A., Ogbuigwe, A., Pradam, M., Neeser, M., & Lauriks, S. (2015). Stories of Change: mainstreaming environment and sustainability in African universities, SA.
- UNESCO Roadmap for Implementing the Global Action Programme on Education for Sustainable Development, (2015).
- Manteaw, O., (2012). education for Sustainable Development in Africa: The search for pedagogical logic; *International journal of Educational Development* 32 (3), 376-383, 2012.
- May, J. R., & Hite, K. (2009). Sustainable Development Law and Policy Not at All: Environmental Sustainability in the Supreme Court. *Sustainable Development in the Courts*, 10(1), 20–29. Retrieved from <http://digitalcommons.wcl.american.edu/sdlp>
- Ogbuigwe, A. (2018). Global Goals: Rising to the Challenge - *The Campus of Possibilities*. 2018 Association for the Advancement of Sustainability in Higher Education Conference & Expo, <https://youtu.be/1NU-JKlcw0w>.
- Orr, David W. (2004). *Earth in Mind: on Education, Environment and the Human Prospect*. Washington: Island Press.
- Sterling, S. (2014). Contradiction or Complement: can higher education be deeper education? Chapter in Corcoran, P. B. & Hollingshead, B. P. (ed)., *Intergenerational Learning and Transformative Leadership for Sustainable Futures*, The Netherlands, pp. 139-151.
- Sterling, S. (2010). Sustainability education: Perspectives and practices across higher education, Taylor & Francis.
- Sterling, S., Jones, P. and Selby, D. (eds). (2010). *Sustainability education: Perspectives and practices across higher education*. Taylor & Francis.
- Tilbury, D. (2011). Higher Education for Sustainability: a global overview of commitment and progress; *Higher Education in the world* 4, 18-28.

Togo, M., Lotz-Sisika, H. (2013). The Unit-Based Sustainability Assessment Tool and its use in the UNEP Mainstreaming Environment and Sustainability in African Universities Partnership. In: Caeiro, S., Filho, W., Jabbour, C., Azeireiro, U. (eds) *Sustainability Assessment Tools in Higher Education Institutions*. Springer, Cham.

Togo, M. (2009), *A Systems Approach to Mainstream Environment and Sustainability in Universities: The Case of Rhodes University, South Africa*. A thesis submitted in fulfilment of the requirement for the degree of Doctor of Philosophy.

Ulkhag, M., Wijayanti, W. R., Wiganingrum, R., Dewi, W. R., & Ardi, F. (2018). Assessing university's sustainability programs from the perspective of university students: a gap analysis. *MATEC Web of Conferences*. 154. 01073, doi: 10.1051/mateconf/201815401073.

United Nations. (1972). Declaration of the United Nations Conference on the Human Environment The United Nations Conference on the Human Environment , having met at Stockholm from 5 to 16 June 1972 , having considered the need for a common outlook and for common principles to in, (June 1972), 1-4.

Wals, A.E. and Blewitt, J. (2010). Third-wave sustainability in higher education: some (inter)national trends and developments. In: Sterling, S., Jones, P. and Selby, D. (eds). *Sustainability Education: Perspective and Practices across Higher Education*, Taylor & Francis.

22. Environmental problems today redefine the fields of ethics and the relationship with the sense of human experience. What ethical challenges are being faced by the different fields and practices of current research?

Global Environmental Challenges: Scientific, Philosophic and Social Implications

Jordi Bruno

Abstract

Humankind is currently facing critical global environmental challenges that are putting the continuity of our human species and its social organisation, at least in the form we know it today, in doubt.

Global climate change due to the accelerated use of fossil fuels has become the most acute of these issues, but there is also a number of global problems related to the intensive use of energy and resources that our “developed” societies are based upon.

Our efforts to tackle these vast problems require Science and Technology to be deeply anchored on ethical principles, and these should guide the choices we will have to make in order to define a valid strategy for the survival of our species.

These critical choices require a fundamental understanding of the scientific and technical challenges involved but also of the social and cultural parameters that condition our construct of societal risk. While University education is clearly geared towards technical and scientific risk assessment, very little is being done on understanding the notions of societal risk.

In this Chapter we present two case studies of global environmental issues in order to reflect on the challenges that education/university and society face today. We explore some of the inherent tensions between the overall global goals and the consequences at a local scale, and some of the lessons learned that could have an impact on the way we currently approach University education and research in the field of environmental risk.

We will prove/show that responses to such challenges require dynamic interplay between science and technology and social sciences and philosophy that must be integrated in University curricula.

Introduction

Humankind is currently facing critical global environmental challenges that are putting the continuity of our human species and its social organisation, at least in the form we know it today, in doubt. It is important to note that our anthropocentric view often confuses the future of our species with the future of the planet.

Earth survived enormous cataclysms long before the appearance of biological life and will still be here whatever damage we do to the conditions that have made the development of life and humankind possible.

Global climate change due to the accelerated use of fossil fuels has become the most acute of these issues, but there is also a number of global problems related to the intensive use of energy and resources that our “developed” societies are based upon.

Our efforts to tackle these vast problems require Science and Technology to be deeply anchored on ethical principles, and these should guide the choices we will have to make in order to define a valid strategy for the survival of our species. This includes critical energy choices to reduce greenhouse gas emissions, the associated quest for critical raw materials and the implementation of circular economy principles. These critical choices require a fundamental understanding of the scientific and technical challenges involved but also of the social and cultural parameters that condition our societal risk. While University education is clearly geared towards technical and scientific risk assessment, very little is being done on understanding the notions of societal risk.

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In this Chapter we present two case studies of global environmental issues in order to reflect on the challenges that education/university institutions and society face today. We explore some of the inherent tensions between the overall global goals and the consequences at a local scale, and some of the lessons learned that could have an impact on the way we currently approach University education and research in the field of environmental risk.

We will prove/show that responses to such challenges require dynamic interplay between science and technology and social sciences and philosophy:

These cases will address:

1. The scientific, social and political challenges concerning energy choices in a climate change situation in an energy-intensive territory such as Catalonia.
2. The scientific, philosophic and social challenges involved in the management of radioactive waste

Introduction

Humankind has been able to evolve thanks to the very particular conditions that make our planet habitable. This is the result of a combination of cosmological, geological and biological events that shaped the Earth into what it is today (Broeker. 1985).

In the 130 years since the industrial revolution, we have changed some of the key conditions of this habitat in an unprecedented manner. This is particularly true regarding the composition of our atmosphere and specifically the concentration of carbon dioxide.

The following Figure 1 depicts a geological record of the CO₂ concentrations in the atmosphere over the years, as extracted from climate.nasa.gov, and obtained by measuring the gas concentrations in ice cores.

Humankind is clearly running an unprecedented experiment with the atmosphere, and one that is very clearly related to the way our society is evolving and developing, and what was described a few decades ago as the “civilization engine”.

Figure 1. Geological record of CO₂ concentrations in ice cores (climate.nasa.gov)

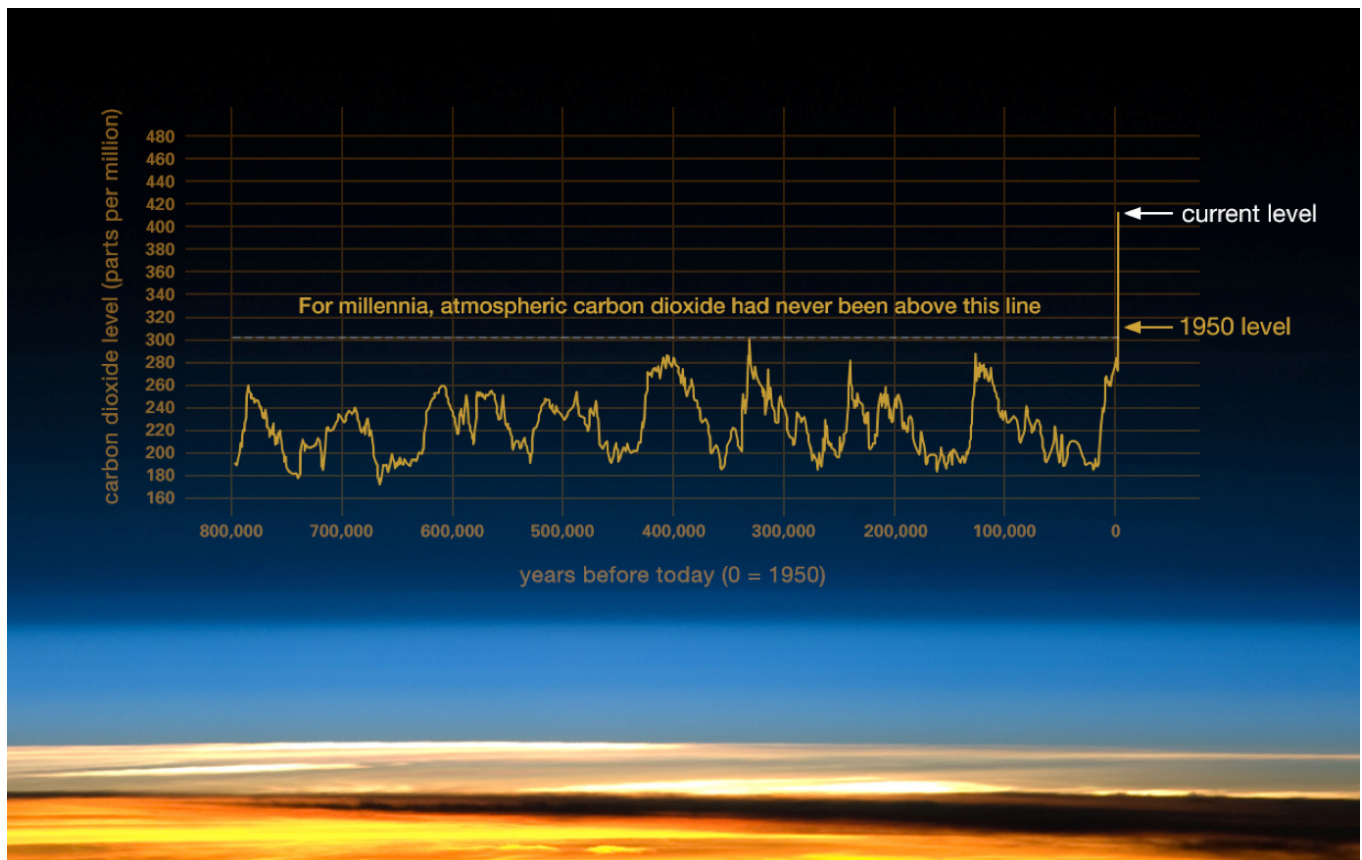


Figure 2. Diagram of the civilization engine (modified from Stumm and Morgan, 1981).

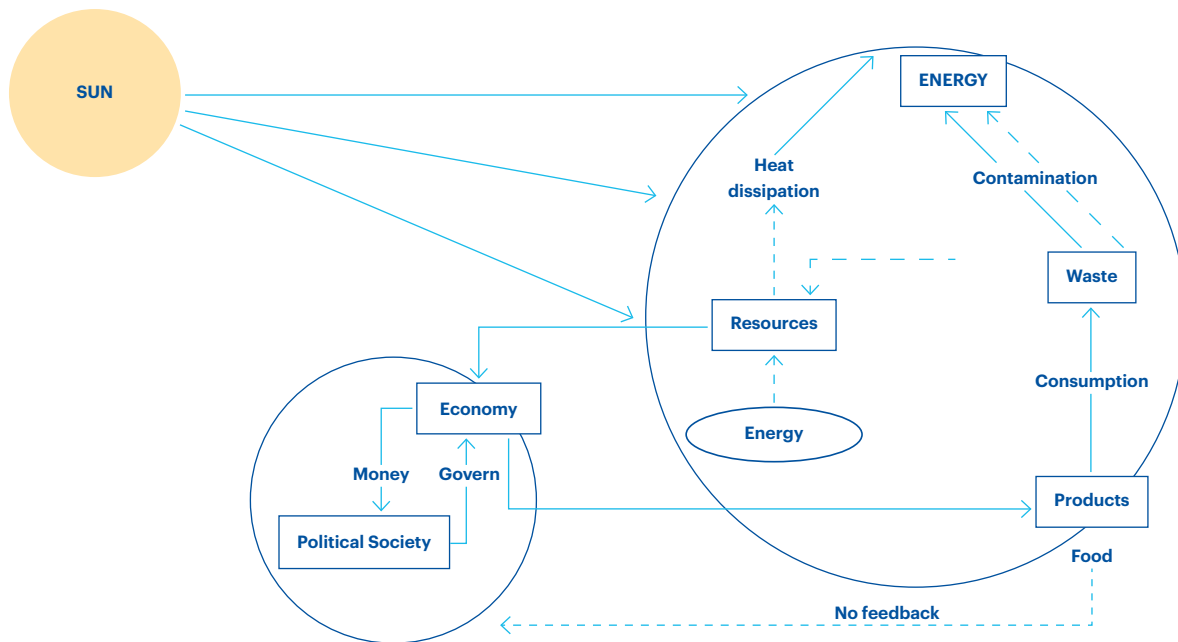


Figure 2 is a diagram of this concept, coined by Stumm and Morgan (1981), that simply but powerfully links the technological, socio-political and economic dimensions.

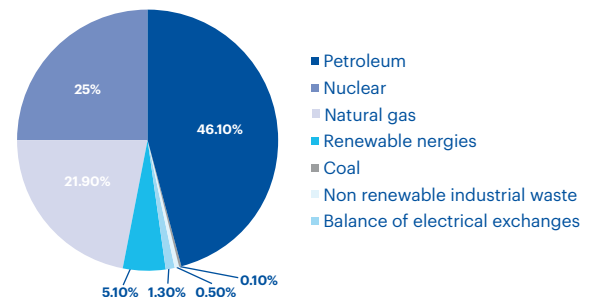
The diagram clearly shows that our political, societal and economic developments have a large impact on the use of energy and resources, and more importantly, on the generation of waste and pollution. The reasons are twofold: the technological wheel is imperfect by definition (because of the Thermodynamic Laws), and more importantly the socio-economic gear turns much faster than the technological one and therefore causes traction of the technological gear with very little feedback.

In the following sections I will give some examples to depict how the lack of feedback between the socio-political and economic wheels and the technological wheel causes malfunctions in our efforts to solve the key challenges related to the climate crisis, energy transition and the scarcity of critical metals.

Case 1. The energy transition in Catalonia

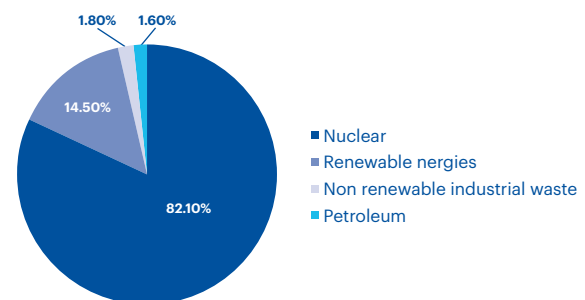
In 2017, the total primary energy consumption mix in Catalonia was 25,517.5 ktep (ICAEN, 2019). The distribution of primary energy consumption by source is depicted in Figure 3 (ICAEN data 2017). Nuclear energy constitutes 25% of the energy consumed, while fossil fuels represent 68%.

Figure 3. Primary energy consumption in Catalonia by source in 2017 (adapted from ICAEN 2019).



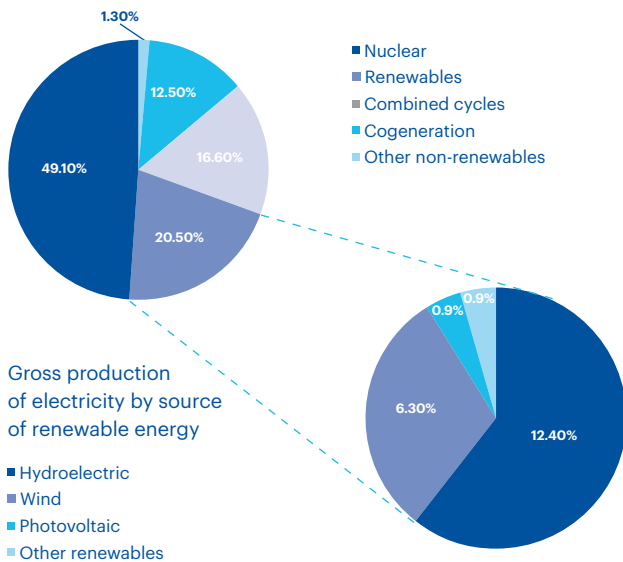
If we look at the primary production side of Figure 4, the predominance of nuclear energy is clear.

Figure 4. Primary energy production in Catalonia in 2017 (adapted from ICAEN 2019).



Furthermore, in 2018, nuclear energy's share of electric power generation in Catalonia was around 50%, while the contribution of renewable energies was about 20% (Figure 5).

Figure 5. Gross production of electricity by source in Catalonia in 2018 (adapted from ICAEN 2019).



In 2017, the Catalan Parliament approved the Climate Change Law that instigated the closure of the three remaining nuclear reactors in Catalonia (two in Ascò and one in Vandellós) by 2027. As shown in the previous Figures, this means a substantial change to the energy mix in terms of production and consumption. Some reflection on the consequences of this decision and the feasibility of its implementation is required.

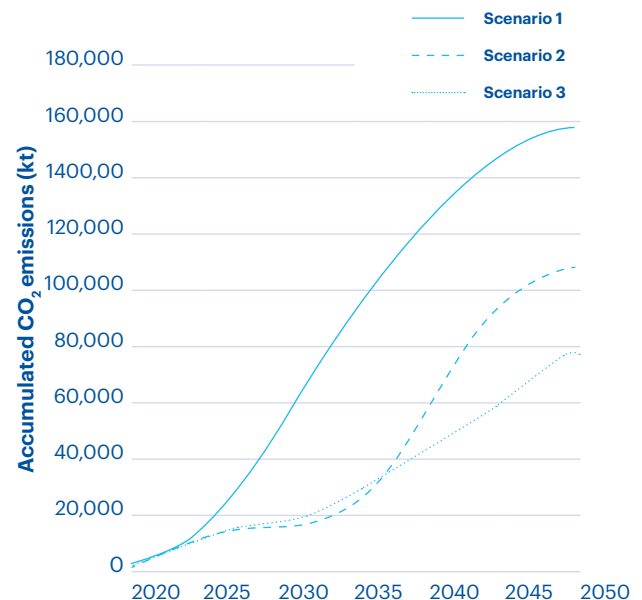
Hence, an energy transition plan called Proencat 2050 is being developed by the Catalan Energy Institute (ICAEN), the main goal of which is the progressive replacement of nuclear sources with renewable ones up to 2050.

The energy challenge in Catalonia is clearly a big one, not only because policy decisions have to be negotiated with the Spanish government, but also because they are totally unrealistic, and backfire in terms of greenhouse gas emissions and therefore of Climate Change. The main reason for this relapse in the fight against climate change is that the only medium-term alternative to compensate for the disruption to nuclear energy production is to use natural gas in combined-cycle power plants, which will lead to increased emissions of greenhouse gases (GHG).

We recently conducted a study commissioned by ICAEN on the consequences of shutting down Catalan power stations, taking into consideration three different timeframes depending on the operational time at closure (Bruno et al 2018). Scenario 1 considered closure at 40 years operational time, scenario 2 considered 50 years and scenario 3 considered 60.

The consequences in terms of increased GHG emissions are staggering, particularly for the earlier closure scenarios 1 and 2. Figure 6 illustrates the overall increase in greenhouse and other gas emissions due to the replacement of nuclear generation with natural gas in the three timeframes.

Figure 6. Evolution of accumulated CO₂ emissions generated in combined-cycle power plants in Catalonia in the 3 scenarios of the study commissioned by ICAEN (Bruno et al., 2018).



In the first scenario, around 142 Mt of CO₂ are added to the atmosphere as a consequence of gas replacing nuclear generation, while in scenario 2 some 73 Mt of CO₂ are added. If we note that the total amount of CO₂ emitted in Catalonia over a 10-year period is around 445 Mt, the 142 Mt emitted as a result of the early shut-down constitute a substantial 32% increase in overall GHG emissions in Catalonia as a result of the so-called Climate Change Law.

In addition, one of the key obstacles to implementing early shutdowns is that Spain lacks the infrastructure to deal with the resulting nuclear waste, a consequence of the mismatch between scientific and technological risk assessments and perceptions of societal risk, which will be explored in depth in Case 2.

Case 2. Scientific, philosophic and social challenges involved in the management of radioactive waste

The context

The use of nuclear energy involves the generation of a highly challenging waste form, used uranium dioxide rods after they have been exposed to nuclear fission. These constitute the spent nuclear fuel (SNF) that is the main source of high level nuclear waste in the open-cycle strategy. Highly radioactive fission products and transuranic elements are contained within SNF, along with unused uranium and plutonium. There are between 7 and 8 kg of Pu generated per ton of U in the spent fuel, which can be reused for energy production by reprocessing methods. This is the main strategy of the so-called closed nuclear cycle. The remaining unused radioactivity content is encapsulated in glass. This is the main waste stream from the closed nuclear cycle.

In both cases the waste is highly radioactive and contains many undesired radioactive elements (radionuclides).

The initial activity is in the order of 10^{17} Bq/m³, but after one year it has decreased to 5% of this value. However, it takes around 1 million years for the SNF to return to the natural radioactivity of non-enriched uranium (see Figure 7) which would be the standard against which to measure the generated radioactivity.

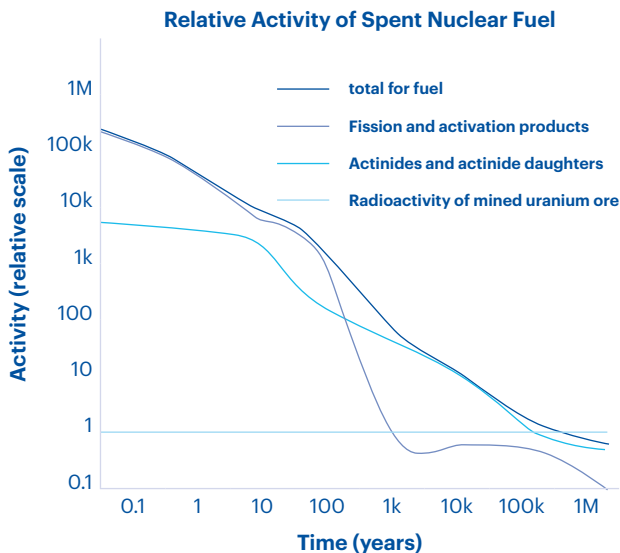


Figure 7. Relative radioactivity of a typical LWR spent nuclear fuel with a burn-up of 38 GWd per tHM as compared with the total activity of the uranium ore required to manufacture the nuclear fuel. The activity is dominated by fission products during the first 100 years and by actinides thereafter. Source: Adapted from (Hedin, 1997).

In spite of the apparent decline in the use of nuclear energy, the amount of SNF generated by civil use is still growing worldwide and the shutdown of nuclear reactors in the USA, Japan and Europe is only generating additional pressure to solve this problem in a rational way, as shown in the following Figures 7a and 7b.

Figure 7a

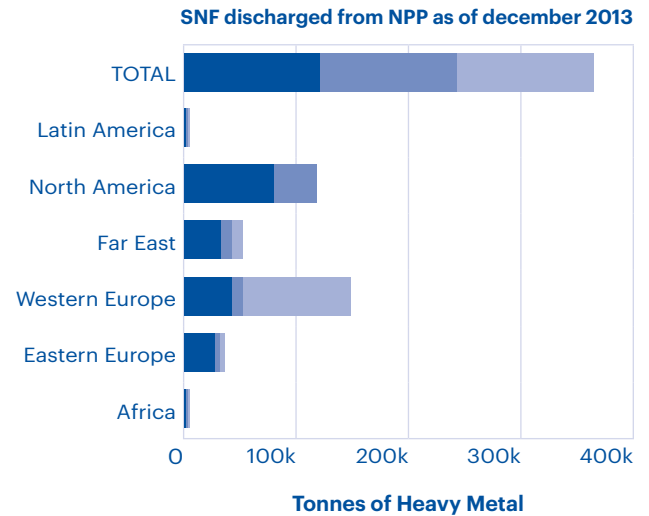
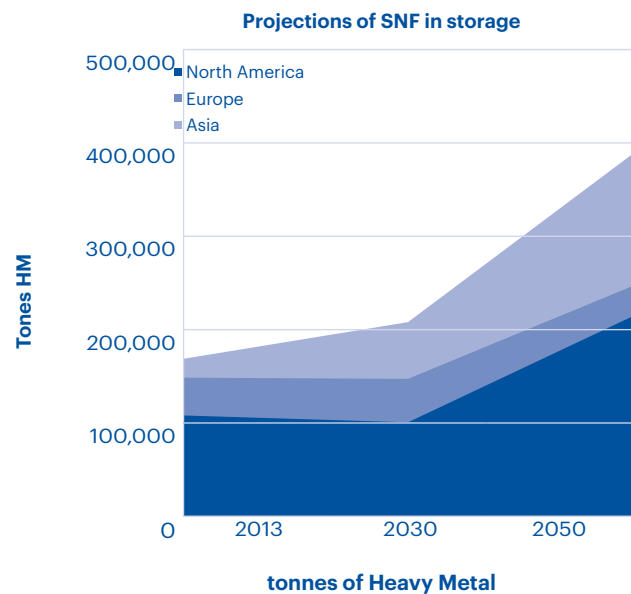


Figure 7b



Figures 7a and 7b. a) Amount of SNF discharged from Nuclear Power Plants until December 2013. No data are available for the Middle East, South Asia and Pacific regions. b) Data for 2013 and projections of amounts of SNF in storage. Data processed from IAEA (2018).

So, both in terms of timeframe and scale this is also a global problem that is associated to the climatic crisis and contains many closely interlinked technological but also societal and ethical challenges.

First, we will look at how are we dealing with the problem from a scientific and technological point of view and then we will discuss the ethical and societal challenges.

How we are dealing with this problem technologically

Deep geological disposal is the preferred route for eliminating stored SNF and high-level waste (HLW). This is mainly based on depositing HLW at great depth in highly stable geological formations and surrounded by a number of engineered barriers to control and suppress any release of the waste constituents to the biosphere.

Different geological materials are proposed as hosts for the repository: mainly clay, salt and crystalline rocks. While many countries have specific plans for geological disposal of high-level nuclear waste, only three European countries (Finland, Sweden and France) have advanced to the stage of having a specific disposal site, and this is the main obstacle for achieving a definitive solution. Site selection is the most critical issue when it comes to handling nuclear waste as it requires the consent of the stakeholders involved.

Finland has made the greatest advances, while Sweden is lagging somewhat behind in the licensing process due to certain technical and legal issues. Both countries share the so-called KBS-3 concept developed by SKB in the early 80's. Figure 8 shows a diagram of this multi-barrier concept, which is mainly based on the long-term stability of the spent nuclear matrix under reducing conditions and neutral to slightly alkaline media (Bruno and Ewing, 2006). The expected times for licencing these repositories are 2020 in Finland and 2025 for Sweden and France. These dates are still uncertain, mainly because of the many political barriers they have to overcome, which is where the ethical and societal issues need to complement the scientific and technological ones.

Figure 8. The KBS-3 method for spent nuclear fuel disposal (SKB, 2010).

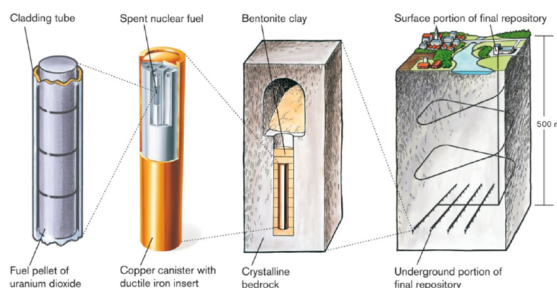


Figure 1-1. The KBS-3 method for disposal of spent nuclear fuel.

Scientific risk assessment vs societal risk construction

Nuclear waste management is one of the areas in which the contradictions between scientific determination of risk and its social perception are clearly differentiated and do not work on similar planes. Therefore, it is not easy for them to meet.

While we scientists make a tremendous effort to pin down the key processes that are expected to occur when nuclear waste is placed in deep geological repositories, and also put major effort into the development of intricate methodologies to assess and quantify this risk, society at large is not at all convinced about the outcome of the proposed methodology. This phenomenon is not unique to radioactive waste management but this is its most widespread, and probably most studied, manifestation.

There are many reasons for this, and in the following section I will try to present some of the key aspects by reviewing the work of cultural scientists.

Bradbury (1989) made an in-depth study of the phenomenon and found that there are two concepts of risk, one that is physically determined by the use of hazardous technologies and the socially constructed notion of risk

The scientifically constructed notion of risk is based on fundamental scientific principles and is composed of basic, demonstrable facts that are the basis for making a scientific decision. The societal risk concept arises from the notion that these facts cannot be separated from the values of the proposers vs the acceptors. Bradbury (1989) indicates that this dichotomy is the basis of a more profound discussion about the role of science and technology in an industrialised and post-industrial society.

The author distinguishes between the concept of risk assessment, the chain of scientific models to evaluate risk, and the concept of risk management defined as the processes by which risk decisions are made (Zimmermann, 1986).

She indicates that while risk assessment is useful to make and develop engineering decisions, it is clearly insufficient to handle societal decisions. This distinction between what we "the experts" propose and societal demands is the basis for many political but also ethical problems, mainly because "the experts" also have

political opinions and social values that are bound to impregnate scientific risk decisions. This is particularly so because we scientists tend to place a high value on the scientific fundamentals while this perception is not shared by society in general.

As Bradbury (1989) pointed out, this notion of absolute (or statistical) truth from the science-based approach implies the wrong concept of educating and convincing society about the notion of risk, rather than explaining the difference between value-based risk management and risk assessment.

A consequence of this notion of socially constructed risk analysis is that risk cannot only be scientifically assessed but also has to be negotiated with society

In practice, this means that unless we listen to and understand the societal concerns about our technological solutions there is very little chance that we will be able to solve some of our key societal challenges.

This is a fundamental reality that it is not considered in our University education, but that should be part of the technical curricula in order to avoid frustration.

In fact, this is what SKB, the Swedish Nuclear Waste Management company, encountered when they launched the geological characterization programme of potential sites for the construction of a spent nuclear fuel repository. The programme was initially constructed on the basis of the scientific approach to risk and only when they humbly approached the small communities concerned in order to understand the values involved and therefore address the risk in a societal context were they able to progress with the site selection programme. This occurred through local referendums following an information and social exchange campaign, working door to door, coffee to coffee.

However, there is an (upper?) societal level that has to be taken into consideration in the resolution of nuclear waste management problems: the political level.

It is not enough for the local population to have a positive view of the risk involved in agreeing to a certain nuclear waste management infrastructure. The political power structure has to be involved in the solution as a part of the societal expression. This is a challenging task, particularly in political systems in which the decision-making powers are distributed among various and often conflicting levels, national vs regional vs local.

This was clearly demonstrated in the latest attempt to select a site for a Spent Fuel Temporary Storage Facility (ATC) in Spain. In the mid 2000's a large EU project called COWAM in Practice (EU 2007-2009)⁽¹⁾ was created to develop the methodology for complex infrastructure projects, particularly in the field of radioactive waste management. Consequently, a number of local committees were created to handle the decision-making process on a local level and in conjunction with the Spanish government's strategy. However, the regional governments were not involved in the decision process, and so the options promoted by the national government and agreed with the local population were ultimately vetoed by the regional governments on many grounds.

The overall consequence is that at present there is no clearly defined spent nuclear fuel management alternative in Spain. This backfires upon the climate goals discussed earlier as there is no current alternative for management of waste produced by the dismantling of nuclear power plants.

Conclusions

The climate crisis poses unprecedented scientific and technological challenges for the survival of our species and the sustainability of our present-day society.

There is a need to reconcile necessary energy policy changes as demanded by society with the boundaries of the energy system to avoid unwanted consequences (see the case of the Energy Transition in Catalonia)

Scientists and technologists must look beyond basic risk assessment as used to optimise engineering solutions and take into consideration the societal risk construct, which involves constant, biunivocal dialogue with society at large, including its political expression (see the case of the Temporary Storage Facility, ATC in Spain).

Scientists and technologists must look beyond basic risk assessment as used to optimise engineering solutions and take into consideration the societal risk construct, which involves constant, biunivocal dialogue with society at large

1. <http://www.cowam.com/>

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References

Bradbury, J. (1989). The policy implications of differing concepts of risk. *Science, Technology and human Values* 14(4), 380-399.

Broecker, W. (1985). *How to build a habitable planet*. New York: Eldigio Press.

Bruno, J. & Ewing, R.C. (2006). Spent Nuclear Fuel. *ELEMENTS* 2, 343-349. <https://doi.org/10.2113/gselements.2.6.343>.

Bruno, J., Batet, Ll., Valls, A. & Bruno, A. *Elaboració d'un estudi sobre els escenaris de futur en relació al paper de l'energia nuclear en la generació d'energia elèctrica en la transició energètica de Catalunya*. Internal Report (ICAEN-2018-00324). Unpublished.

Hedin, A. (1997). *Spent nuclear fuel - how dangerous is it? A report from the project "Description of risk"*. Stockholm: Swedish Nuclear Fuel and Waste Management Co.

ICAEN. (2019, June 17). Balanç Energètic de Catalunya 2017 i Balanç Elèctric 2018.

International Atomic Energy Agency. (2018). Status and trends in spent fuel and radioactive waste management. *IAEA Nuclear Energy Series No. NW-T-1.14*. Vienna: IAEA. Retrieved from: <https://www.iaea.org/publications/11173/status-and-trends-in-spent-fuel-and-radioactive-waste-management>

Stumm, W. & Morgan J. (1981). *Aquatic Chemistry: An Introduction Emphasizing Chemical Equilibria in Natural Waters*. New York: John Wiley and Sons Ltd.

Zimmerman R. (1986). The Management of Risk. In: Covello V.T., Menkes J. & Mumpower J. (eds) *Risk Evaluation and Management. Contemporary Issues in Risk Analysis*, vol 1. Boston: Springer, MA.

Part 9

Engagement

23. How can current public institutions maintain and promote their commitment to social equality and the universal availability of all knowledge for everyone? What concept of equality can we defend that does not contradict that commitment to diversity and reciprocity between cultures and lifestyles?

The ‘Open’ University as a Transformer of Public Service Ideals

Paul Benneworth, Julia Olmos-Peñuela, Lucy Montgomery,
Cameron Neylon, John Hartley, Katie Wilson

Abstract

One of the paradoxes of encouraging university-society engagement has been the limiting of the publics that benefit from university knowledge. The modernisation and marketisation of universities has forced higher education institutions to enclose and capitalise on their resources to compete, thereby creating new barriers to public access. Perhaps the most egregious examples are large pharma companies’ patenting practices, whose new drugs depend heavily on public research investments, but are often so expensive that the publics whose taxes paid for them cannot afford them. Despite the high-level commitment among university leaders to the ideals of public service in HE, the modern university risks becoming an organisation working against societal equality, diversity and reciprocity. This chapter explores how universities address this by empirically examining how public service ideals and being ‘open to all’ can strengthen universities institutionally. The Open Science movement has emerged as a reaction against publicly-funded research being hidden behind paywalls, creating profits for publishers and knowledge for subscribers but not for society. Ultimately, open science’s value lies not in making facts available, but in allowing publics to meaningfully hold universities to account by seeing the results they produce. We therefore argue that the reinvention of the university as a defender of public service ideals requires the need to ingrain ‘openness’ more deeply into universities, allowing publics to meaningfully participate in shaping universities’ knowledge activities. Building on this Open Science example to illustrate how public universities can promote commitment to societal access to university knowledge, this chapter considers how openness functions across universities’ key knowledge processes. We present examples from both teaching and research, highlighting how successful activities create mutual benefits between university and community. We finally outline a model for the ‘open university’ as a means of upholding commitments to public equity at a time of administrative efficiency.

Key ideas

- Universities are knowledge institutions: they curate, develop, store, create, critique, transfer, exchange and retire various kinds of knowledge relating to the real world.
- University knowledge processes – teaching, research, public engagement, knowledge exchange and community service – take place within knowledge communities who learn collectively, and in turn access knowledge within society.
- This mutually productive exchange between society and universities depends upon porous institutional boundaries that allow free flows of knowledge.
- Universities’ capacities for openness have recently come under threat from efforts to make universities more responsive to external signals.
- Taken together, they risk decoupling the university from societal partners, and ultimately undermining the relevance and the utility of the knowledge they create for the society that funds them and grants them privileges.
- An open knowledge institution is one that participates in and develops larger scale ‘knowledge commons’ beyond its own walls.
- Universities actively seeking to be open put work into ensuring there is a diversity of voices in the conversations taking place around different knowledge activities.
- Open Knowledge Institutions act as networks of knowledge, spanning common disciplinary boundaries and campus barriers in order to serve as agents for societal change.

Introduction

Universities evolved as institutions that create societal benefits *indirectly* through the effects of their core activities (Benneworth 2014). Universities are knowledge institutions: they curate, develop, store, create, critique, transfer, exchange and retire various kinds of knowledge relating to the real world. Their knowledge is universal and general, but achieves value by being applied to specific situations. They enjoy high degrees of autonomy in creating that knowledge, in order to avoid pressure from sponsors leading their knowledge to become too specific, and of less societal value.

The risk for universities is that this drive for autonomy could lead to a withdrawal from society, which in turn damages societal support for them. In the past, universities have dealt with this tension by operating as porous, open institutions; and by inviting various kinds of societal partners into their knowledge communities. These partners may be businesses, policy-makers, civil society and citizens, who participate in knowledge-making and sharing activities, and can access emerging knowledge more easily through their prior participation in associated learning activities.

A mutually productive exchange between society and universities depends upon porous institutional boundaries that allow free flows of knowledge within and across these knowledge communities. But universities are now facing all kinds of pressures to ‘harden’ their boundaries. The irony of the virtual university was that it made the university more concrete, requiring administrators to draw firm distinctions regarding who could or could not participate in virtual learning communities (Cornford & Pollock, 2003). A range of other factors threaten the porous boundaries between university and societal actors: the switch to students as consumers, the increasing importance of commercial income, the dominance of academic publishing by profit-making publishing houses all create challenges.

In this chapter, we therefore examine openness in university knowledge processes against these pressures to close their ‘porous’ boundaries. We develop a conceptual model for the ‘open university’ as an ‘open knowledge institution’ (without passing judgement on any existing Open University in various countries), and reflect on a number of promising practices for delivering this in the contemporary university.

Defining openness in terms of university knowledge practices

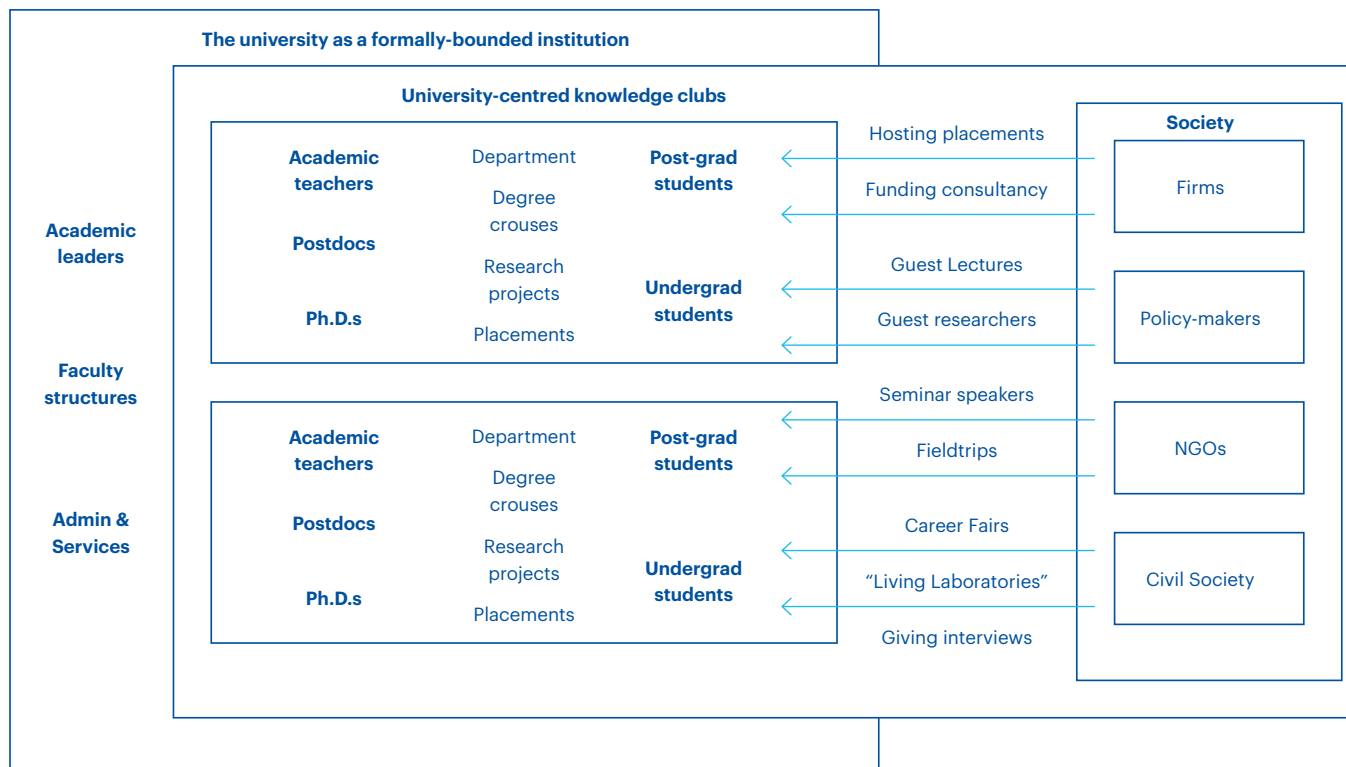
University knowledge processes – teaching, research, public engagement, knowledge exchange, or community service – take place within knowledge communities who learn collectively, and in turn access knowledge within society (Degn et al. 2018). That knowledge is produced by groups not individuals, what we here call ‘knowledge clubs’ (Hartley, et al. 2019), which work best when organised, governed and sustained in ‘open knowledge systems’. Universities are constellations of groups, some quite ‘tribal’ (Hartley 2018), some interconnected into a larger ‘knowledge commons’ (Potts & Hartley 2015), others to private knowledge systems (patent, copyright, trade secrets). Thus, what they produce is not a ‘public good’, but is a ‘club good’ held primarily by the group that participates in making it; a ‘knowledge club’ is not ‘open to all’ but can ultimately improve societal capacities by a process of mutual translation of knowledge across group boundaries.

University knowledge processes – teaching, research, public engagement, knowledge exchange, or community service – take place within knowledge communities who learn collectively, and in turn access knowledge within society

Consider for example the ‘knowledge club’ that emerges around companies hosting placement students on degree courses, coordinating with professors to ensure those placements run smoothly (Benneworth & Olmos Peñuela 2018);

- Students learn to apply their knowledge in an operational context;
- Companies have a mechanism that allows acquisition of the latest knowledge;
- Teachers gain insights into state-of-the-art business environments;
- Project reports are written that may be deposited in institutional repositories;
- The degree programme as a whole is enriched by these activities.

Figure 1. The porous university and university-centred knowledge clubs. Authors' own design after Benneworth (2017).



Knowledge clubs can have second-order effects whereby 'club knowledge' is shared across a wider knowledge base or 'commons', improving teaching and research more generally, benefiting the scientific process as a whole. Ultimately, open science's value lies in creating collective knowledge resources that diffuse outwards to create societal capacity, allowing a social "system to thrive in a changing uncertain world: where not everything is known or can be known a priori about the world" (Montgomery et al 2018:31).

A second element of 'openness' value comes through the opportunities that this creates for publics to shape knowledge practices (*Nature* 2004). Societal partners participate in these knowledge communities as members of clubs that work collectively to advance knowledge, creating shared knowledge that serves a range of different beneficiaries. They can influence the directions that those collective learning processes take, permitting social alignment without public veto.

Tensions and barriers to openness in competitive university systems

Universities' capacities for openness have recently come under threat from efforts to make them more responsive to external signals. In the last thirty years, higher education has been 'modernized', introducing a range of private sector disciplines to public-sector practices (Kickert et al. 1995). There has been a metricisation of universities, in which they are rewarded on the basis of their delivery of 'outputs' (De Boer et al. 2007). Funding is subject to the fulfilment of external quality criteria (Moore et al. 2017). Activities such as research evaluations and teaching accreditations have become essential for universities to certify that their 'outputs' meet funders' requirements.

Universities' capacities for openness have recently come under threat from efforts to make them more responsive to external signals

Universities have responded by directing internal resources much more tightly towards activities that

deliver those funder ‘outputs’. In Norway, whilst the publication reward model accounts for less than 2% of public funding for universities, it has acquired a dominant effect on university research management practices (Aagaard et al. 2015). This metricisation has perversely ‘hardened’ universities’ institutional boundaries: things that can be ‘counted’ as outputs are claimed, accredited and invested in by the university, whilst other activities are framed as peripheral and unworthy of institutional support. Social impacts that come through second-order effects such as the transformation of disciplinary knowledge systems or student subjectivity are not metricised; policymakers require that countable ‘impact’ to occur outside of academia.

Metricisation has created many barriers to knowledge flow and interaction in these open knowledge communities, including:

- Disciplinary-based research evaluations rating researchers’ performance within disciplinary fields (e.g. publishing in particular journals) hindering the development of fruitful multidisciplinary relationships.
- Pressure to publish research in ‘excellent’ (international, English-language) journals may reduce the accessibility of that knowledge to local non-English speaking communities.
- Ownership of highly rated journals by profit-seeking publishers may see research being published in ways that mean that society simply cannot access that research.
- Pressures on universities to maximise their commercial income may lead them to introduce restrictive regulations on academics seeking to work with third parties that stop all kinds of engagement.
- Universities may defund public engagement activities that do not directly lead to the delivery of outputs such as adult education, public lectures and science shops.
- Education accreditation requirements (such as English proficiency, formal teaching qualifications) may make it harder to involve outside partners as guest lecturers or tutors on courses.

None of these effects make it impossible for society to participate actively in knowledge communities, but they encourage situations where it is the exception rather than the rule. Taken together, they risk decoupling the university from societal partners, and ultimately undermining the relevance and the utility of the knowledge

they create for the society that funds them and grants them privileges.

In short, knowledge is caught up in what are called ‘social network markets’ (Potts et al. 2008). It is here that universities make the mistake of seeking (with very poor overall results) to ‘commercialise’ the knowledge-outputs of their research centres within public evaluation systems (Harman 2010), while neglecting (or over-auditing) the formation and coordination of knowledge clubs themselves.

Taken together, they risk decoupling the university from societal partners, and ultimately undermining the relevance and the utility of the knowledge they create for the society that funds them and grants them privileges.

Diversity driving openness in knowledge institutions

A university is not a ‘public service institution’ (like a broadcaster), for the fundamental reason that ‘open’ is not the same as ‘public’ (Hartley et al. 2019: 29, 33). An ‘open knowledge institution’, therefore, nurtures the formation of specialist knowledge clubs, and supports their internal structures, processes and rules, while ensuring that their outputs are sharable externally and engaged in mutual learning, benefit and resilience-sustainability.

Thus, an open knowledge institution is one that participates in and develops larger scale ‘knowledge commons’ beyond its own walls, not one that trades in knowledge-transfer and proxies for prestige, such as ‘high-cite’ professors with multiple publications in prestige journals like *Nature* and *Science*. Universities that embrace openness are building a “common pool resource” (Ostrom 1990) for future knowledge-making groups to exploit via unanticipated innovation (Potts and Hartley 2015).

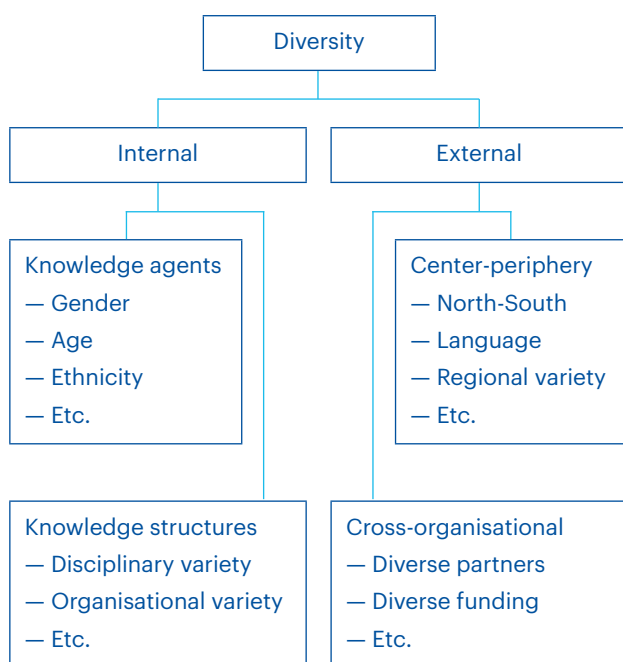
One consequence of openness for universities is that there is a diversity of participation in the groups involved in the production of knowledge. Universities that actively seek to be open put work into ensuring there is a diversity of voices in the conversations taking place around different knowledge activities. Dimensions of diversity here include:

1. Populations that have been ignored, disadvantaged, colonised, and marginalized;

2. Perspectives that defy or challenge traditional disciplinary boundaries to include researchers with different disciplinary focuses and tools;
3. Intellectual outputs that extend beyond the article, book or dataset, e.g., digital scholarship, short-form monographs, translations, public scholarship;
4. Learning spaces and knowledge objects to engage more learners in more creative pedagogies;
5. Degree alternatives that encourage partnerships between learners, teachers, and communities;
6. Collaborative partners from the public and private sectors;
7. Co-creators of knowledge, including students, researchers and the public;
8. Centre/Periphery power dynamics to include voices from across the spectrum;
9. Voices representing a range of languages through translations and other activities.

(Montgomery et al. 2018: 89-91).

Figure 2. Dimensions of diversity in open knowledge institutions (Montgomery et al 2018: 87)



Closure and opening in the field of humanities

How can universities and researchers ensure that they ensure openness? Openness involves everyday academic practices that make knowledge more accessible to wider stakeholder communities, including those presently unknown. Research impact depends on academics ensuring that their knowledge practices are also driving openness. In Australia, there are pioneering examples of openness around research and scholarship in Aboriginal and Torres Strait Island communities. The Museum of Freedom and Tolerance in Western Australia (<http://mftwa.org.au/>) seeks to address testimonial injustices faced by marginalised voices by creating a virtual museum where those communities can present their own stories and see them virtually curated into a powerful record of those injustices. Likewise, Australian Research Council funded researchers have created a Wikipedia Incubator site for the endangered Noongar language of S.W. Western Australia (https://incubator.wikimedia.org/wiki/Wp/nys/Keny_mia). The idea is to open language resources to Noongar people wherever they live, using a widely available internet platform, and to test how such open technologies can assist an endangered minority language, on the grounds that in a globalised, digital world, all languages are world languages. Knowledge must be open to the same systems that are used by speech-communities, who alone can ensure their continuation and growth.

Closure occurs when academics make their work less open, responsive or accountable to a wider set of stakeholder communities. Academics tend to operate in relatively closed groups that we call 'knowledge clubs' (Hartley et al. 2019). Universities are constellations of such clubs, and need to play an active role in keeping academic work in touch with wider publics. A particular risk here comes from the thoughtless application of performance management tools that do not reflect the diversity of research practices and uses. Although the Times Higher Education Sustainable Development Goals identify those universities that are measurably working towards the SDGs, it remains to be seen whether these new rankings will stimulate copycat

behaviour and steering by indicators, undercutting universities' broader capacities to address the SDGs. Likewise, research evaluation systems that shape publication practices towards politically desirable channels and inhibit publication for more general consumption in the name of driving excellence also risk driving closure (Gao & Zheng 2018).

Examples of open universities in practice

The Open Science movement has emerged as a reaction against publicly-funded research being hidden behind paywalls, creating profits for publishers and knowledge for subscribers but not for society .

<http://www.unesco.org/new/en/communication-and-information/portals-and-platforms/goap/open-science-movement/>

The Science Shop movement (and Living Knowledge Network) has a long pedigree of connecting citizens with students to allow the latter to gain study points by working on questions of interest to societal groups that are unable to hire in consultants.

<https://www.livingknowledge.org/>

The Demola model at Tampere University involves students working on projects for companies. If the companies like the work, they are able to buy it back but the students retain ownership.

<https://www.demola.net/>

DesignLab at the University of Twente in the Netherlands brings societal partners into the university to interact with students and staff. This results in the production of knowledge tailored to the needs of partners.

<https://www.utwente.nl/en/designlab/>

University research units, government and public service organisations in South Africa collaborate to produce Action Dialogues. The Mandela Initiative is an effort to bring together knowledge located in university, government, church and community organisations in order to address specific challenges.

<https://www.mandelainitiative.org.za/>

The Learning to Be project at the University of Aveiro involves students going into businesses and working in multidisciplinary teams with entrepreneurs and academics to develop creative new solutions for those entrepreneurs' companies.

https://www.ub-cooperation.eu/pdf/cases/S_Case_Study_L2B.pdf

The MetaArchive Cooperative is an independent association of libraries, archives and museums in the Americas and Europe dedicated to digital preservation and geographically dispersed "dark archives" of members' digital materials.

<https://metaarchive.org/>

The Public Knowledge Project based in Canada is a multi-university initiative that develops open source publishing software and conducts research to improve the quality and reach of scholarly communication and public research.

<https://pkp.sfu.ca/>

The Chinese National Knowledge Infrastructure network is a national database of journals, theses, conference papers, newspapers, books, patents, statistics, software and other scholarly outputs.

<http://new.oversea.cnki.net/index/>

Scientific Electronic Library Online (SciELO), a co-operative multi-institutional initiative in Latin and South America, promotes open access to scholarly output through a bibliographic database, digital library, and platform for electronic publishing.

<http://www.scielo.org/php/index.php?lang=en>

The Brazilian Virtual Herbarium is a collection of preserved flora and fungi and associated data from different providers that offers free and open access to data, information, and tools.

<http://inct.splink.org.br/index>

PatientsLikeMe is a personalized health network of non-academic scientists that connects and shares knowledge and evidence-based data relating to the management and treatment of a range of health conditions, enabling up-stream research, including by University-based teams.

<https://www.patientslikeme.com/about>

(Montgomery et al 2018: 15).

Our diagnosis: structures and systems to encourage open universities

For universities, becoming open involves making a series of mutually self-reinforcing changes in ways that incentivise open practices and discourage closed practices, actively encouraging diversity and rooting out practices that encourage homogeneity. Systems and structures that facilitate two-way sharing of knowledge are vital for ensuring that universities engage effectively with changes occurring beyond the institution. This involves not just encouraging diverse strategies for sharing internally-made knowledge with external groups, but providing feedback loops sensitising university knowledge actors to complex changes in their operational landscapes, new opportunities for adding value and networks by which value can be leveraged.

At their core, Open Knowledge Institutions act as networks of knowledge, spanning common disciplinary boundaries and campus barriers in order to serve as agents for societal change. These institutions operate via a set of protocols and are governed by commonly understood and flexible/non-hierarchical rules and procedures that morph and change over time without seeking to regulate knowledge for market demands. They are oriented towards co-production of knowledge with and for broader communities. Open knowledge institutions of higher learning foreground and prioritise the constituent communities that their students, alumni, faculty, staff, administrators, partners and collaborators both comprise and promote (Montgomery et al. 2018: 40). In an open system, evaluation criteria must expand from isolated notions of excellence to metrics that include notions of innovation, utility and engagement under uncertainty.

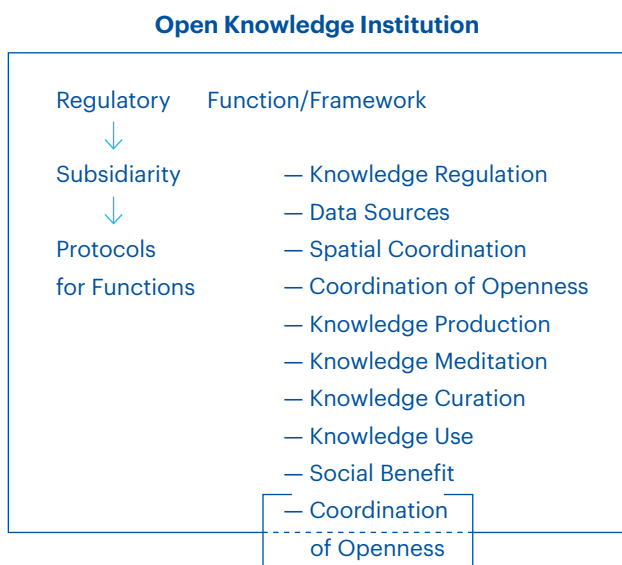
Open Knowledge Institutions act as networks of knowledge, spanning common disciplinary boundaries and campus barriers in order to serve as agents for societal change

Formal open university structures must be accessible to (a diversity of) external voices to sustain a longer-term evolution towards openness and resisting operational pressures towards enclosure. University managers should lead strategically, working against formal policies and informal cultures that might discourage

openness e.g. pressure to publish in prestigious journals. There needs to be investment in openness tools that knowledge actors can use at the individual level to enact various kinds of open research practices, such as institutional repositories. An open knowledge institution needs to coordinate openness policies and practices in sharing access to knowledge. While open access to publicly funded research through institutional repositories is promoted, there appears to be less consideration of how academic library access policies may affect the delivery of institutional aspirations for open access to knowledge in general. Library preferences for purchasing publications in electronic formats with associated licenses limit access and usage to core library users, and decrease the availability of research to external, unaffiliated users (Courtney 2003). Academic library collections still include archival and print resources, and physical access to such knowledge collected by libraries remains important, but the maintenance of public access is tricky given pressures from digital commercial publication and demands for Open Access (Wilson et al 2019).

Universities will only manage to be open if openness measures are included among the variables that shape institutional priorities and decision-making, whether institutional KPIs or for individual evaluation. Open university cultures are accepting of this broad idea of openness as a modus operandi rather than a set of discrete tasks that can be added onto a business-as-usual model. Linking engagement with core knowledge processes ensures that both universities and societal partners benefit from this openness. The qualities of openness should be reflected in the stories that a university tells about itself, whether internally or externally, as something that it does because it is good for itself and helpful for its core activities.

Figure 3. Open knowledge institution: coordination of functions (Montgomery et al. 2018: 56)



Recommendations for promoting open knowledge institutions

Current contemporary pressures risk driving universities to orient engagement and commercialisation activities around highly restrictive readings of societal contributions that reduce the openness and diversity permitted within university structures. The optimisation of university contributions, including from the humanities, requires the creation of open university structures that maximise opportunities for diversity of participation in university knowledge clubs. Openness is never finished; active steps are necessary to promote, expand and sustain that diversity, and in this final section we make recommendations for encouraging and sustaining open university practices.

Higher education policymakers should not encourage universities to pursue a limited number of simplistic goals identified with elite universities, based on abstract proxies for quality rather than looking at the value of university outputs. Any league tables or rankings that envisage a particular kind of world class university should be treated on the basis of their capacity to capture and value open knowledge practices.

University regulators and funders should eliminate rules that unfairly penalise universities for encouraging diversity of publication, by pursuing abstract, internationalised versions of teaching and research that have little salience for particular local contexts. Funding models' outputs should be calibrated to avoid unnecessarily penalising open behaviour by academics, such as rewarding non-credit bearing community education or local language publications.

University leaders should seek to ensure that the knowledge networks around their universities are open to local participants, and are actively supportive of alternative voices and perspectives to seek out university partners. Recognising and acknowledging university individuals that engage with a diversity of voices is vital for creating a culture where openness is valued as an enriching feature rather than being criticized as an absence of excellence.

University administrators should develop promotion, recruitment and tenure regulations that actively recognise and value the additional work that goes into expanding and sustaining open institutional boundaries and encourage academics to build diverse knowledge activities. Institutional 'engagement' policies should balance universities' fiduciary responsibilities against academics' needs to explore opportunities, and institution infrastructures should support a wider range of engagement activities beyond technology transfer and commercialisation.

University staff have a strong role to play in building academic cultures where openness is valued, rewarded and encouraged, particularly in preparing the next generation. Academic supervisors and Ph.D. teachers should explore ways to ensure that Ph.D. and post-doc programmes expose academics in their formative stage to open research and teaching practices. Academic teaching qualifications should emphasise open teaching practices, and students should be prepared for learning actively in pedagogic knowledge clubs that include a diversity of voices.

References

- Aagaard, K., Bloch, C. and J. W. Schneider (2015) Impacts of performance-based research funding systems: The case of the Norwegian Publication Indicator, *Research Evaluation*, 24(2), pp. 106-117.
- Benneworth, P. (2014) Decoding university ideals by reading campuses in P. Temple (ed.) *The physical university*, London: Routledge.
- Benneworth, P. (2017) Smart policy mixes for stimulating university-based ecosystems: relevance & engagement in an age of excellence and uniqueness, Keynote presentation to "University based entrepreneurship & regional development", Pécs, Hungary 30th November
- Benneworth, P. S., & J., Olmos-Peñuela (2018) Resolving tensions of research utilization: The value of a usability-based approach, *Science and Public Policy*, accepted 17th March 2017 (in press).
- Courtney, N. (2003) Unaffiliated users' access to academic libraries: a survey, *Journal of Academic Librarianship*, 29(1), pp. 3-7.
- Degn, L., Franssen, T., Sørensen, M.P. and S., de Rijcke (2018) Research groups as communities of practice, *Higher Education*, 76(2), pp. 231-246.
- De Boer, H.F., Enders, J. and L., Leisyte (2007) Public sector reform in Dutch higher education: The organizational transformation of the university, *Public Administration*, 85(1), pp. 27-46.
- Xuesong Gao & Yongyan Zheng (2018) 'Heavy mountains' for Chinese humanities and social science academics in the quest for world-class universities, *Compare: A Journal of Comparative and International Education*.
- Harman, G. (2010) Australian university research commercialisation: perceptions of technology transfer specialists and science and technology academics, *Journal of Higher Education Policy and Management*, 32(1), pp. 69-83.
- Hartley, J. (2018) What Hope for Open Knowledge? Productive (Armed) vs. Connective (Tribal) Knowledge and Staged Conflict. *Cultural Science Journal*, 10(1), pp. 27-41.
- Hartley, J., Potts, J., Montgomery, L., Rennie, E., & C. Neylon (2019) Do we need to move from communication technology to user community? A new economic model of the journal as a club, *Learned Publishing*, 32, pp. 27-35.
- Kickert, W. (1995) Steering at a Distance: A New Paradigm of Public Governance in Dutch Higher Education. *Governance*, 8, pp. 135-157.
- Montgomery, L., Hartley, J., Neylon, et al. (2018) *Open Knowledge Institutions: Reinventing Universities*. Perth, WA: Centre for Culture & Technology, Curtin University; and at MIT Press.
- Moore, Samuel, Cameron Neylon, Martin Paul Eve et al.. (2017), 'Excellence R Us': University Research and the Fetishisation of Excellence, *Palgrave Communications* 3 (January), p 16105.
- Nature Editorial (2004) Going public: should scientists let the public help them decide how government research funds are spent?, *Nature*, 341 (7011), p. 883.
- Ostrom, E. (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge UK: Cambridge University Press.
- Potts, J., Cunningham, S., Hartley, J., & P., Ormerod (2008) Social network markets: A new definition of the creative industries, *Journal of Cultural Economics*, 32(3), pp. 167-185.
- Potts, J., & J. Hartley (2015). How the social economy produces innovation, *Review of Social Economy*, 73(3), pp. 263-282.
- Wilson, K., Neylon, C., Montgomery, L., & C-K. Huang (in press 2019). Access to academic libraries: an indicator of openness? *Information Research: An International Electronic Journal*, 24(1).

24. How can we relate such phenomena as populism and the discrediting of democracy with respect to the ways that humanities are practiced (or not) today? When politics reinforces identities and the clash between identities (religious, cultural, etc.), what role can the humanities play?

A Society of Interpreters

Daniel Innerarity

**This article is a summary from the book Innerarity, Daniel. (2013). The Democracy of Knowledge. New York: Bloomsbury Academic.*

We have gotten used to understanding the world as something immediate, available, and easily accessible. The typical discourse about the knowledge and information society views society in terms of the circulation of goods and data, whose appropriation is not problematic. The dominant ideology is reproductive and communicative transparency, as if the correct reading of data simply required a corresponding code. This way of thinking tends to underestimate the moment of interpretation that exists with all knowledge. It favors immediate economic profitability and knowledge that is scientific and easily transferrable to technological devices. It undervalues other types of knowledge, such as artistic, intuitive, practical, or relational knowledge. This is a question worth examining because it entails gambling not only the future of the humanities, but the destiny of our political communities.

The failed connection between the sciences and the arts—to use a contrast that may be outdated but that we all understand—could lead to a confrontation between data-driven economic sciences and interpretation-driven political arts (Citton 2010). In contrast to reducing communication to the mere production of information or viewing the digital revolution as a mere investment in technology or the information society as a society of machines, the emphasis placed on interpretation underscores the active and complex nature of all knowledge. This is the true challenge of our time: interpreting data to obtain experiences and discourses to acquire meaning. This is where human and social sciences stand out as specialists of meaning, as types of knowledge that produce and evaluate meaning.

There is an axiom that places all expectations of collective progress on the development of knowledge understood through the model of scientific accuracy and technological practicality. But the truth is that most of our current debates do not revolve around data and information but around their meaning and relevance. In other words, the question is how we should interpret them and what is desirable, just, legitimate, or con-

venient. When we admit that what is at stake in these conflicts is less objective knowledge and more interpretation, it means we must “de-neutralize” knowledge and give it all the political weight that it has when we are valuing its human meaning. To put this into familiar terminology: beyond the material infrastructure of the knowledge society, there is a whole symbolic superstructure where the true questions of individual and collective existence play out.

Most of our current debates do not revolve around data and information but around their meaning and relevance

In an attempt to prophesize, Ray Kurzweil (2005) claimed that by 2048 our inboxes will be receiving a million emails every day, but a virtual assistant will manage them without us having to worry. It may even be possible for nano receiver transmitters to connect our synapses directly to some super-machine to enable us to think a million times faster. The problem is what “thinking” means under such conditions. As opposed to reducing intelligence to the reading of data or the acceptance of predefined forms, we must emphasize that knowledge requires not only free access to information, but also the ability to eliminate the “noise” of what is insignificant. Data storage is not decisive in the way that the interpretation of information is. The problem is not the availability of information but its assessment (its degree of reliability, relevance, meaning, the use that can be made of it).

The art of interpretation is by definition inaccurate, concrete, and attentive to irregularities. Humanistic disciplines are somewhat undisciplined, to the extent that they interrogate, criticize, assess, or contextualize. Interpretation is a cognitive operation that must improvise without implicit codes, decide in irregular environments, and anticipate what we do not know. It all has to do with that reference to concreteness that characterizes the arts and puts into play an “economics of singularities” (Karpik 2007), in place of an economics of scale, the division of labor, and mass production.

The problem is not the availability of information but its assessment (its degree of reliability, relevance, meaning, the use that can be made of it)

Knowledge that confines itself to the concrete rather than the general has a strong intuitive dimension. From the imperialism of the universal sciences, interpretative intuition has been presented as a lesser form of knowledge, when not as completely irrational. But experience shows us that it is not wise to do without these forms of knowledge, especially in highly complex contexts. If we think about things like the crisis provoked largely by the mathematization of the economy or the ecological imbalances that certain technologies invoke, what we have is a highly contradictory picture: pretensions of accuracy have given way to irrational decisions. The only way we have been able to correct this social inaccuracy is through cultures of interpretation (those critical environments in which we question the insertion of technologies into society, we argue about their social applications, and we assert ethical and political criteria). The interpretative intuition practiced by the humanities has an enormous epistemological, heuristic, and prudential value in spaces of major uncertainty (as found in societies today).

When certainties are scarce, getting a general idea is more important than the accumulation of data or the detailed examination of one sector of reality. Generalist interpretations position us better than specialized knowledge. This is why future foresight is in such demand. The most unsettling questions that we face have to do with the way things might evolve (when will we get out of the crisis?, how will terrorism change?, what will voters do?). The most useful knowledge is not the knowledge that refers to an immediate or sectorial utilization but the knowledge that gives us a general idea about what is going to happen. This affords us the opportunity to set in motion such important operations as anticipating, foreseeing, favoring, or ensuring future eventualities. Prophetic activities—from weather forecasts to perspectives for economic growth, passing through opinion polls, risk assessment, and strategic gambling—are in well-deserved disrepute, but at the same time, they are more necessary than ever. To satisfy this growing demand for foreknowledge, we do not need data as much as abilities to interpret the available information. It was never as necessary as now to develop the art of reasonable prediction, which also includes interpreting the trustworthiness of prophecies and prophets.

Interpretation also has a special value in contexts dominated by rapidity and automatism. We live in societies in which communication flows are continuously passing through us. Fluctuation societies require filters to avoid being crushed by meaningless information or banal clichés. True epistemological sovereignty comes from interrupting, not from reacting mechanically: not responding to emails immediately, resisting acceleration, avoiding a stimulus-response model, not contributing to panic or euphoria, establishing distance and delay, postponing responses, and even making something new and unpredictable possible. Subjective intelligence and freedom need to be established, especially nowadays, as centers of indetermination and unpredictability.

The interpretative intuition practiced by the humanities has an enormous epistemological, heuristic, and prudential value in spaces of major uncertainty

We have always connected the idea of education with authenticity, with the ability to think for oneself. Does this ideal still make sense in a knowledge and information society? It probably does, but only if it is understood through a new nuance that connects true innovation with error or naïveté, distancing it, in other words, from those forms of thought and action in which it is not possible to make a mistake. To put this more provocatively: we need fools who make mistakes, who think for themselves, beyond truisms, about what is said or about information accepted as such. Both Strauss put it particularly emphatically: “there is an enormous loss of genuine foolishness or, stated in a more positive fashion, an enormous loss of naïveté. We no longer meet human beings but interlocutors through whom everything that is said flows. They let themselves be crossed by everything that moves through the communication channels. There is no longer clear discrimination or any form of naïveté; it is covered by the varnish of exterior intelligence” (Strauss, 2000).

Does all of this have any particular political value? How do we represent the interpretation culture politically? In what sense can we affirm, as Martha Nussbaum does (2010), that democracy needs the humanities? We can understand this contribution precisely through the political value of interpretation. Our collective destiny is intimately connected to the capacity to interpret our everyday habits and our needs; it depends more on a good interpretation of what makes a life truly human

than on handling observable data. The political value of interpretative cultures consists of placing citizens at the center of social transformations. It requires people who interpret, in other words, who discuss, deliberate, and decide. A society of interpreters is a society that assesses itself, discusses, and is capable of taking responsibility for anything new that emerges in social processes.

The political value of interpretative cultures consists of placing citizens at the center of social transformations

If we view our democratic societies as societies that interpret themselves, then we have greater possibilities for breaking from the dominant paradigm that views the knowledge society as the vertical encounter between experts and the masses. Democracy can be understood as the political system that begins with the assumption that we are all interpreters. Society is the fragile and conflict-filled idea-sharing session of our interpretations, somewhat more democratizing than the submission to some supposedly objective data.

A society of interpreters is a society that assesses itself, discusses, and is capable of taking responsibility for anything new that emerges in social processes

Against the automatism of readers, the idea of a society of interpreters is more discontinuous, complex, and unstable. A society understood in this manner does not fit with politics understood through a model of simple management. A politics of interpretation presumes to always abandon commonplaces, reconsidering our priorities, describing things in another way, formulating other questions, etc. In the face of this democratic indetermination, all would-be realists have always called on the data to prevent the exploration of possibilities. But we know that this is nothing but a subtle form of power that consists of insisting on the data without questioning the hegemonic practices through which precisely that data and no other is obtained. We have learned this critical dimension of interpretation in the cultivation of what we call the humanities, which is, of course, the greatest education for the people.

References

- Citton, Yves (2010). *L'avenir des humanités*. Économie de la connaissance ou cultures de l'interprétation, Paris: La Découverte.
- Karpik, Lucien (2007). *L'Économie des singularités*, Paris: Gallimard.
- Kurzweil, Ray (2005). *The Singularity is Near. When Humans Transcend Biology*, New York: Penguin.
- Nussbaum, Martha (2010). *Not for Profit: Why Democracy Needs the Humanities?* Princeton University Press.
- Strauss, Botho (2000). *Ulrich Greiner spricht mit Botho Strauss*, en *Die Zeit*, n° 23/2000.

Special Chapter

Integrating the Sustainable Development Goals (SDGs) in Higher Education

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This special contribution to the GUNi Higher Education in the World Report 7 focuses on Integrating the SDGs in Higher Education.

Preface

This special contribution to the GUNi World Higher Education Report 7 focuses on Integrating the SDGs in Higher Education.

There are five sections in this collection; the opening section provides arguments as to why Higher Education Institutions (HEIs) need to engage with the Sustainable Development Goals (SDGs). It demonstrates practical ways in which HEIs can integrate the SDGs into their core functions of teaching and research. There are also four sets of stories about HEIs that are contributing to four SDGs in four different countries and contexts. The first story is about water in Africa, and how research of the issue can enable contributions towards achieving SDG 6. The second story is about SDG 4, learning and teaching mathematics for children from low income households in rural Durban. Making Indian cities inclusive and inhabitable in partnership with local stakeholders is the focus of the third story—SDG 11. And SDG 8, focused on dignified employment for poor communities in Sardinia, Italy is the subject of the fourth case study. While each case study stands on its own, describing teaching and research functions carried out in relation to that specific SDG, there are some common threads across these experiences that are illustrated in the opening section. We conclude with a series of reflections across all of the case studies.

Budd Hall & Rajesh Tandon

Introduction

The United Nations (UN) system universally adopted the Sustainable Development Goals (SDGs) in 2015 as a beacon for socially, economically and ecologically sustainable development. This 2030 Agenda establishes 17 Goals that are universally applicable to all countries of the world⁽¹⁾. Within this globally agreed and universally applicable framework, each country (and many provinces) has developed (or is in the process of developing) specific national and locally relevant benchmarks and indicators for achieving these commitments. While these SDGs are broadly acceptable to all countries and peoples, and have been developed through an extensive consultative process to enable wider ownership; achievement of this ambitious agenda by 2030 faces several deficits in terms of capacity:

- Ensuring sustained political support from national and sub-national government leaders is the first such deficit. Political leaders in most democratically governed jurisdictions tend to make generally short-term (3-4 years at most) decisions with a view to winning the next elections. This severely limits the continuity of policies and programmes across the SDG time-frame. Recent executive actions by the Trump administration in the US have already begun to undermine this process.
- The second deficit for achievement of the SDGs is investment of adequate resources in each country and

1. <https://www.un.org/development/desa/disabilities/envision2030.html>

region. In the contemporary economic environment, it is uncertain whether all countries, and the global community, are able to adequately finance their work towards all of the SDGs. Trade conflicts between China and the US, and the re-emergence of war-like events in the Korean Peninsula, Iran, the Middle East and South Asia are just some manifestations of the diversion of resources from the socio-economic and ecological agenda towards war machinery.

- Thirdly, deficits in institutional and human capacities are also beginning to affect the implementation of practical strategies for the achievement of the SDGs in many countries. Most governmental actions are designed to function in silos, pursuing narrow objectives, one SDG at a time. In contrast, most SDGs can only be achieved through simultaneous actions with regard to several of the sub-goals. For example, the achievement of SDG 5—gender equality—will not be possible without simultaneous actions towards the achievement of SDGs 3 and 4; SDG 3 focuses on health, including women’s health, while SDG4 focuses on education, especially targeting the education of girls and women. Both these goals can only be achieved in many societies when patriarchal attitudes change to prevent violence against girls/women and to enable their mobility.
- Fourthly, lack of knowledge is the most critical deficit hindering the achievement of the SDGs. Dominant existing knowledge systems are founded on the principle of instrumental rationality. Modern science practiced over the past three centuries has been posited on the premise that scientific knowledge can be used to control and mine nature and its huge resources. Alternative perspectives of knowledge are required to fill this knowledge deficit in ways so that learning and collaboration are organically linked to generating locally relevant solutions for the SDGs⁽²⁾. Higher education and its myriad institutions can address this knowledge, learning and collaboration deficit for achievement of the SDGs.

Such a contribution from higher education institutions (HEIs) is possible if higher education is viewed within the broader societal context, and not merely as educating for jobs and livelihoods. However, many recent debates on higher education have focused on quality, financing and student mobility. Bigger questions about the social

2. Alternative perspectives of knowledge are required to fill this knowledge deficit in ways that learning and collaboration are organically linked to the generation of locally relevant solutions for the SDGs.

relevance of higher education have only just begun to be raised afresh. As the 6th GUNi Higher Education in the World Report (2017) clearly argued: “Social responsibility emerges as the need to reconsider the social relevance of universities in light of the encounter of the local with the global, regarding priorities, demands, impacts and knowledge needs in the context of globalization. The competitiveness of nations – as the only way to achieve progress – should be balanced with inclusive social development and sustainability of the entire global population.”⁽³⁾

HEIs and universities, therefore, are public institutions, contributing to public goods, irrespective of the nature of their financing. “Treating higher education as a private good, to be financed by the individual students benefiting from it, as economists have argued; is to severely curtail the real and potential contributions of higher education”⁽⁴⁾. In many societies, regions and communities, HEIs are among the most resourced institutions. They have enormous physical infrastructures (classrooms, laboratories, residences, office space, recreational facilities, etc.) which are far superior to anything available to local communities, or even local government agencies. And much of this infrastructure is underutilized, when viewed through the 24X7/365 lens. HEIs also have enormous digital capacity in terms of hardware, software and human-ware. They have financial resources, endowments and revenue streams. The intellectual resources and capacities of HEIs are unparalleled in their regions. Most importantly, HEIs have youthful energy, commitment and hope, as is reflected in their students. At the GUNi International Conference on Sustainable Development Goals in September 2017, Federico Mayor Zaragoza, Former Director-General of UNESCO remarked that “Universities have abandoned their previous commitment to educating future citizens. In this world where globalisation of indifference is growing, universities must prepare their students as citizens who practice and value freedom, equality and solidarity”⁽⁵⁾.

Higher education institutions (HEIs) can serve the public good of supporting achievement of the SDGs locally and globally when this perspective is integrated in the core missions of a HEI—teaching and research.

3. http://www.guninetwork.org/files/images/imce/guni_print.pdf
 4. https://www.livingknowledge.org/fileadmin/Dateien-Living-Knowledge/Dokumente_Dateien/making_the_commitment_-_sdgs.pdf
 5. <http://unescochair-cbrsr.org/index.php/2017/10/03/preparing-global-citizens/>

As part of this approach, the SDGs should be integrated into each of the core missions:

- Promoting learning and teaching about the SDGs
- Knowledge generation and mobilisation towards finding innovative solutions to help achieve the SDGs

Curricular and Teaching Functions of Higher Education Institutions

Teaching, the facilitation of learning, is the most common and widespread function of all HEIs. They can do many practical things to align student learning and teaching to the various SDGs. This can be done across all disciplines and courses at an HEI. Knowledge about relevant SDGs, and their underlying analysis and rationales, can be integrated in teaching by all faculties, disciplines and professional courses at each HEI. Teachers can include the relevant SDG information along with other reading on courses across the disciplines. Students can be encouraged to produce papers linking their studies, for example in biological sciences, electrical engineering, forestry or ocean sciences, with the targets and challenges posed by the SDGs. Community engaged learning where students work with members of the community on specific challenges such as food security and housing affordability offers a chance to combine community expertise with STEM and humanistic knowledge.

Three practical ways can be used to align teaching at HEIs with the SDGs, thereby creating an integrated learning opportunity for students:

Community engaged learning where students work with members of the community on specific challenges such as food security and housing affordability offers a chance to combine community expertise with STEM and humanistic knowledge

1. Modifying current curricula - for the planet

The case studies in this section come from Canada, the USA (Hawaii), India, Italy and South Africa. Each of them in their own ways makes the case for integrating science, engineering and maths with humanities and social sciences. The larger case that they make is that in the world of community, family life and work, all forms

of knowing are integrated. The example of maths teaching from South Africa shows that when the subject is contextualized within the human and social dimensions of students' lives, they do better at maths! The case study about the Water SDG shows how story-telling and arts-based and arts-informed teaching can bring STEM content together with both community based knowledge and the humanities and social sciences. Again the urban planning studies from India illustrate the impossibility of separating technical 'scientific' knowledge from humanistic knowledge. The authors discuss the results of the imposition of a colonial planning model on Indian cities that had been planned for human centred life centuries before. Suddenly cars and an economic infrastructure led by STEM disciplines were imposed over the ancient patterns of cities. The results are that millions poor people were left to design their own slums with no resources. At the service of short-term economic rationality, the community has been sacrificed.

Existing syllabi and curricula can be revised and updated to bring in certain aspects of relevant SDGs that have not been considered so far. Those with experience in curriculum development or curriculum inquiry linked to formal schooling in the first and second levels, are aware that curricula vary greatly. Ministries or Departments of Education in most parts of the world control public schooling. At a national or a regional level, the state controls the broad and narrow elements of the curriculum as part of its accepted mandate. While different schools or teachers do treat curricula differently, there is an established overall framework or syllabus for both elementary and secondary schooling. This is largely not the case in all higher education jurisdictions around the world. The professions of engineering, education, medicine, social work, law, psychology and nursing, for example, most often have regulatory bodies made up of members of the respective professions. In these cases, through accreditation protocols, the professions themselves broadly influence the curricula, whose content is not normally controlled by the state.

In those areas of higher education where one finds a majority of the students in the sciences, humanities, social sciences, fine arts and so forth, there are no regulatory bodies associated with content, and curricula are organised through disciplines. Anthropology at one university is likely to look like Anthropology at any another university. History may well take diverse foci from one department to another, but it is the historians and the anthropologists who, in a complex manner,

decide on the appropriateness of a particular set of courses. At the heart of university curricula are the individual course instructors and professors.

And while inter-disciplinary or problem focussed academic programmes have increased in number over the years, the disciplines are still firmly in control of the canon at the vast majority of universities. As Philip Altbach points out, the central higher education canon is increasingly dominated by content based on English-language and Western knowledge (Altbach 2004).

While inter-disciplinary or problem focussed academic programmes have increased in number over the years, the disciplines are still firmly in control of the canon at the vast majority of universities

But when we take even a brief look around the world, we can see that in spite of the fragmented process of curricular change in higher education, change is happening. While it is true that universities around the world are for the most part teaching from the dominant Western canon, what some would call a colonial knowledge framework, there are changes within disciplines and new disciplines are even arising. They have sprung up as part of a complex interactive global discourse among academics, public intellectuals, social activists, political voices and others. Take for example SDG5, which focuses on 'achieving gender equality and empowerment of girls and women'. Ordinarily, this topic will not be covered on an undergraduate economics degree. However, the syllabus of such a course could include topics like: How do constraints faced by women affect participation in the labour force? How does this impact GDP and other dimensions of economic development? How do restrictions on the mobility of girls affect their education at secondary and post-secondary levels?

2. Introducing new courses

In order to expand students' knowledge of different SDGs and their underlying analysis, HEIs could introduce new courses at undergraduate and graduate levels.

For example, there are currently very few courses on the subjects of water and sanitation in relation to SDG6 with a focus on ensuring access to these resources. New courses for engineering students may be designed with an exclusive focus on water harvesting, storage,

safety and distribution. Management programmes could design a new course on logistical and business planning for sustainable 24x7 water supplies to urban and rural habitats. New courses for students of civil engineering and architecture could focus on affordable individual and collective sanitation systems. The case study from Sardinia, Italy offers an interesting possibility for a new course. Based on the sustained involvement of the FOIST and InHum laboratories at the University of Sassari and its community partners, a new tool for participatory and empowering pedagogy has emerged. They call this tool PISA and recommend it as a model for community development and asset identification. It could easily become the focus for a new course that combines aspects of urban planning, pedagogical innovation and participatory research.

Our case study on water begins from the biological observation that the human body is composed of 80 per cent water. We are water. The development of courses based on community engaged storytelling and arts-based and informed pedagogies would provide us with a means to bring together the 'science' of water with the 'lives' of water.

3. Role of interactive pedagogies

Teaching methods at HEIs are becoming more interactive through the advancement of digital learning tools. In addition, experiential learning methods can be introduced to the learning of existing subjects and courses in a more engaged manner with the real world and society-at-large, and not merely in the classroom. Innovative interactive pedagogical tools can be adopted to enable students to learn the subject matter of their courses in interaction with the society around them. SDG2 is critical for the survival and well-being of many societies today-'End hunger, achieve food security, improve nutrition'. Faculties of agriculture could include certain topics to be taught in their communities, such as traditional dietary habits and organic agriculture. Faculties of business could require students to conduct field projects on food storage and supply chains. Faculties of medicine could design community level internships to learn about factors affecting hygiene and malnutrition. Food, nutrition and hunger can be learnt by all students through engaged interactive pedagogy, irrespective of the discipline or course they are studying.

Innovative interactive pedagogical tools can be adopted to enable students to learn the subject matter of their courses in interaction with the society around them

There are real world examples of how teaching and learning have become more participatory in each of our case studies. The work from India, which originates from both civilian urban redevelopment managers and the work of PRIA (Participatory Research in Asia) and from academia through the design studio work done at Manipal University, illustrates a model of student engagement in urban planning. It is important to note that in the design studio work, community engagement was not as effective as had been anticipated. But the way forward for more interactive pedagogies involving students, academics, community organisations and the people themselves is clear. The experiments with the teaching of Maths to struggling youngsters in Durban are also instructive. Attempts to teach maths through abstract and repetitive traditional approaches failed. But when the subject was integrated into the cultural, working, political and linguistic lives of the young people, they acquired skills much more easily. That story reminds us of the experiments of the late Paulo Freire in Brazil, who in the 1960s began to teach a group of sugarcane workers how to read. By building language around thematic issues from their own lives, such as housing, transportation and food, those sugarcane workers learned to read in 45 days (Sanders 1968).

Research Function at Higher Education Institutions

All HEIs engage in research by their faculty and students. There is increasing pressure on HEIs to show excellence in research. Research Innovation is regarded as being an essential part of the transformations of human activity that will lead to the achievement of the SDGs⁽⁶⁾. Of particular importance are the increasing expectations from the field of research. In the context of the SDGs, research needs to contribute much more to the generation of knowledge for achieving the SDGs in different contexts. In addition to generating an understanding of phenomena, research is now perceived as being able to provide 'new solutions, through appreciating and incorporating alternative perspectives of knowledge' (Hall and Tandon 2017). Achievement of

the SDGs also requires finding new solutions to various socio-economic challenges, and new knowledge will be essential towards this end. HEIs can forge partnerships with local communities and stakeholders to co-create whatever knowledge is appropriate to local contexts and decision-makers, and which is a pre-requisite to finding sustainable solutions. This, in essence, lays the foundations of 'engaged research', which requires moving beyond traditional notions of top-down research (dictated by academics), to a more collaborative/participative form, where research questions are framed in accordance with local community needs, and research is designed in collaboration with the local stakeholders who are impacted by the particular problem (Hall and Tandon 2017). High-quality, engaged university research in strategic developmental areas can inform good policy, and can unearth solutions to key problems across all SDG focus areas (ACU 2015). Calls for this form of engaged research has played a critical role in establishing the validity and appropriateness of 'Community Based Participatory Research (CBPR)', as a method that has the potential to provide sustainable solutions to critical societal challenges, and thus contribute towards achieving the SDGs. The W. K. Kellogg Foundation⁽⁷⁾ Community Health Scholars Program defines CBPR as "a collaborative process that equitably involves all partners in the research process and recognizes the unique strengths that each brings. CBPR begins with a research topic of importance to the community with the aim of combining knowledge and action for social change"⁽⁷⁾. CBPR can effectively contribute towards the "development of new knowledge and insights on various societal challenges linked to SDGs, and play an important role in providing sustainable solutions for the same."

Engaged research requires moving beyond traditional notions of top-down research (dictated by academics), to a more collaborative/participative form

6. <https://ideas4development.org/en/strengthening-societal-contribution-research/>

7. <https://www.wkcf.org/>

Three practical ways can be readily adopted to undertake research in respect of locally relevant SDGs:

1. Frame locally usable research

Students and faculty at HEIs may frame their research questions to produce locally useful and actionable knowledge. Structured and regular interactions with local actors—district administration, local government, local community, civil society or local business—may generate research questions that are relevant for the achievement of the SDGs locally. For example, SDG9 is targeting resilient infrastructure and sustainable industrialization. Engineering faculty and students at HEIs may study specific infrastructure gaps from the perspective of resilience in a city or district. Departments of energy, minerals and mining may find it interesting to research topics on green technologies for local industry. Students and faculty of economics and business may define their research to help small/medium businesses in that location to become resilient. Monitoring air quality and water treatment systems could be an actionable research project for student and faculty teams.

In the case of the design studio work done in several cities in India, architecture and planning students carried out studies involving local businesspeople, government officials and citizens on planning priorities for their communities. The Foist Laboratory associated with the University of Sassari brilliantly illustrates the benefits of a long-term relationship with a specific community. In the Sassari case, the working class neighbourhood of Santa Maria di Pisa made up of social housing and small businesses has partnered with the social work unit at the University and with other service organisations since it was constructed in the late 1970s. The community association has been working with students and academics for many years to enable the community to build its own capacity for development. It must be noted however that the overall levels of unemployment in Sardinia have made the challenges very difficult to overcome. Dependence on welfare remains much higher than the community would like.

The case study on water draws from critical feminist approaches to arts-based research and storytelling. It describes the recording of video vignettes in the context of action for clean water and sanitation in Africa, contending that these are more than “just stories”. Although they deal with environmental justice, they are to be considered equally valuable to quantitative, statistical and epidemiological knowledge that traces large-scale trends over time.

2. Build knowledge partnerships

HEIs could nurture local partnerships to generate long-term research; in order to achieve this they need to create boundary-spanning structures which enable various faculties and community actors to explore the possibility of cross-cutting partnerships (Hall, Tandon and Tremblay 2015). However, when dealing with such partnerships, it is equally important to be mindful of the existing power differentials among partners, their respective capacities and capabilities to contribute to the partnership, and their impacts on such collective efforts. A well thought out and designed partnership, in turn, increases its impact on the process as a whole. For example, SDG11 focuses on improving the quality of urban life. HEIs can partner with municipalities to contribute new knowledge for improved urbanization and governance of urban services. Most cities lack the capacity to generate and maintain population data, especially where rapid migration is occurring. Several faculties — of statistics, urban studies, planning, economics, etc. — can support such research. Studies of land use in urban areas and in-situ improvements to housing infrastructures could be carried out by faculty of architecture, geography and engineering. Operations research faculty and students could perform mobility analyses to provide insights into transportation design in cities. Once such partnerships are built, ongoing nurturance of relationships by HEIs could enable a wide variety of research opportunities for students and faculty in support of the SDGs.

A fascinating partnership involving the teaching of mathematics is presented in the case study from South Africa. It was established between the Department of Mathematics at the Durban University of Technology and the Jirah Academy, a ‘fees-free’ college set up to offer a second chance to young people without education, employment or training. It involved the development of a maths teaching environment that was constructivist in nature, taking into account the social and emotional environments within which these people lived. The students were encouraged to ‘eat, drink and sleep’ mathematics, in the hope that they would all succeed in mastering the content. The long-term partnership began in 2012 and resulted in the young people doing very well at maths and the university learning a lot about new approaches to teaching.

3. Strengthen new competencies

Current training in research methodologies at most universities does not prepare students to build partnerships. Little attention is paid to such attributes as trust-building, listening, critical thinking, awareness and ethical orientation. Furthermore, training in research methodologies does not teach students to integrate disciplinary interests with local research priorities. Students and their teachers do not know how to share their research findings with local stakeholders, other than in the form of research papers written for journals or books, but these skills can be learned. Several innovative efforts have been implemented for the training of the next generation of researchers in 'community-based participatory research methodologies' (Harkavy et al. 2017). Additionally, research training can include an understanding of multiple forms and sources of knowledge in society, and the skills required to learn from them, an understanding of ethics and values in research, power dynamics in partnerships, self-development as a researcher, etc. Competencies in knowledge mobilisation can also be learnt, as several HEI systems have begun to emphasise (Hall, Tandon and Tremblay 2015). Therefore, HEIs interested in contributing to the achievement of the SDGs through their research expertise may need to invest in teaching new research competencies to both students and faculty. The box below outlines one such initiative, Knowledge for Change (K4C), launched by the UNESCO Co-Chairs in Community Based Research and Social Responsibility in Higher Education, for training next generation researchers in community based participatory research⁸.

Knowledge for Change Consortium (K4C)

The K4C Global Consortium for Training in Community Based Participatory Research was launched by the UNESCO Chair in Community Based Research as part of a partnership between the University of Victoria in Canada and the Society for Participatory Research in Asia (PRIA) based in New Delhi, India. The strategic goal of the K4C is to support the emergence of K4C training hubs in countries of the global South and the excluded North. Each hub is a partnership between a university and a civil society or practitioner organisation and engages in training across all disciplines and

sectors bringing together STEM, professional, humanities and social science scholars. Importantly, each hub focuses on one or more of the UN SDGs. K4C hubs are supported by a 21-week Mentor Training Programme led by the UNESCO Co-Chairs, Rajesh Tandon and Budd Hall, and combining online and face-to-face learning.

"The Global consortium of Knowledge for Change (K4C), promoted and nurtured by the UNESCO Chair in Community-based Research & Social Responsibility of Higher Education, is building local partnership Hubs between universities and civil society to offer training in Community-based Participatory Research for the study of local SDGs.

We approached these Hubs to invite them to tell us about their teaching and research in this regard. The ones that responded most enthusiastically are those whose contributions were co-developed. They described their stories with respect to the specific SDG that they were focusing on, and how it was their own work that was the basis for selecting these particular SDGs."

References

- Association of Commonwealth Universities. (2015). *Progress and potential: Higher Education playing its part in the SDGs*. The Association of Commonwealth Universities.
- Altbach, P. G. (2004). Globalisation and the University: Myths and Realities in an Unequal World. *Tertiary Education and Management*, vol. 10(1), pp. 3-25.
- Hall, B. and Tandon, R. (2017). *Community Based Participatory Research and Sustainable Development Goals*. The Canadian Commission for UNESCO's IdeaLab.
- Hall, B., Tandon, R. and Tremblay, C. (2015). *Strengthening Community Universities Partnerships: Global Perspectives*. University of Victoria.
- Harkavy, I., Hartley, M., Hodges, R. and Weeks, J. (2017). Recognizing Excellence in Engaged Teaching & Scholarship: The University of Pennsylvania's Experience. In GUNi (ed). *Higher Education in the World Report 6, Towards a Socially Responsible University: Balancing the Global with the Local*. Girona: GUNi.
- Sanders, T. G. (1968). The Paulo Freire Method. *West Coast South America Series*, vol. 15(1).

8. http://unescochair-cbrsr.org/pdf/K4C_flyer-Final.pdf

1. Our Bodies Are Made of Water: Stories and Community Vignettes

Crystal Tremblay and Sarah Marie Wiebe

For many organisms, if not all, water makes up the majority of our corporeal composition. It is a necessary element for survival. As a vital nutrient for every living cell, water serves multiple essential functions to sustain life on the planet. It regulates body temperature, absorbs shocks, lubricates joints, metabolizes and transports food within the bloodstream and flushes waste. In 2010, the United Nations declared water and sanitation to be a human right. But how might we move from the ability to not just survive, but to thrive? As the United Nations Sustainable Development Goals (SDGs) highlight, citizens - human and non-human - access water unevenly. In particular, here we focus on UN SDG #6: Clean Water and Sanitation. This goal alerts our attention to the realities experienced by communities around the globe, which are profoundly gendered, and localized. Whether we look at the lack of potable water in indigenous communities across Canada or how women confront barriers to clean water in South Africa, it becomes clear that water stories expose asymmetrical power relations, and the persistence of colonization and environmental injustice in our current time. As a result of poor infrastructure, an uneven distribution of goods and bads when it comes to local economic development, the World Health Organization informs us how millions of people continue to die due to diseases - ranging from diarrhea to cholera to typhoid and polio - as a result of insufficient water supplies and unsanitary conditions. For over a billion people worldwide, their water is contaminated with feces. By 2025, half of the global population will live in “water-stressed areas” (WHO 2019). This timeline is imminent. At the same time, there is sufficient water on the planet to address this inequity. We know that it does not have to be this way.

While we alert the reader’s attention to these pressing concerns surrounding clean water and sanitation, we suggest that there are alternatives. The time is ripe to listen to the voices of communities themselves who carry, enact and embody situated bodies of knowledge. Policy officials and decision-makers must not just hear, but also listen to their stories. Here we demonstrate how storytelling is a powerful avenue of communica-

tion for the articulation, expression and, ultimately, implementation of water stories. From our prismatic lens of feminist political ecology paired with knowledge democracy (Tremblay and Harris 2018; Wiebe 2015; Hall et al. 2013), we draw upon situated experiences as narrative community vignettes in order to discuss the fluid connections between citizen voices and participatory policy dialogue centred on the issue of access to clean water. As such, we demonstrate and discuss here some of the ways in which higher education serves as a vehicle to connect practice with policy. Developing further our storytelling method, which draws from community vignettes and participatory videos, we aim to tell a story about the co-construction of knowledge, identification of local solutions, and implementation of these in decision-making. Drawing upon examples in Ghana and South Africa, we profile community vignettes as a demonstration of the process and significance of co-construction in addition to providing an analysis of how knowledge emerges from multiple forms of expertise, which we understand as central to a movement for the democratization of knowledge. This transdisciplinary gesture weaves together diverse fields of inquiry including Science, Technology, Engineering and Math (STEM), Humanities and Social Sciences. Thus, we contribute to a continuous, ongoing and emergent global conversation about the imperative value of transdisciplinary forms and sites of knowledge.

The core of our argument here stems from an assertion that community voices must be at the center of water governance conversations. As we see with protest movements around the world over access to water resources (i.e. *‘Idle No More’* in Canada, *‘#NODAPL’* in the USA to name only two), tensions become apparent when hierarchical top-down decision-making practices trump visceral lived-experiences. Water governance informed by the fluid stories that emerge from within communities has the vital potential to transform processes. In order to move away from yet another water crisis story - and there are many - we turn to examples that emphasize community connection and collaboratively designed consent-based policy processes. Scholars

affiliated with the POLIS project at the University of Victoria, for instance, developed a model of collaborative and consent-based decision-making on water governance in Northern Canada (Phare et al. 2017). As their research reveals, public officials must go beyond consultation to engage in meaningful consent-based decision-making. Within an indigenous context, this entails integration of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and an emphasis on the principles of free, prior and informed consent (FPIC). There is much for us to learn from the Canadian experience that may very well resonate with other communities around the world.

Watery Subjectivity: Feminist Political Ecology and Knowledge Democracy

Our bodies engage with water in multiple ways. Informed by feminist political ecology, a field that weaves together insights from political ecology and critical feminist studies, here we elaborate how emotions and empathy are central to how we understand water stories (Tremblay and Harris 2018). We explain how affected citizens' lives embody watery subjectivities: full of meaning, stories and narrative. As a feminist mode of inquiry, this fluid, feeling approach features and profiles lived-experience, engages situated bodies of knowledge and aims to understand issues of water sanitation from community experts. We do not propose to examine environmental problems or questions of ecological governance from a removed position of objectivity. Resisting the "god trick" that Donna Haraway warns us about, we instead centre relationships in the framework and methodology advanced herein (Haraway 1988). As an interpretive mode of inquiry, to understand the stories citizens tell about water concerns, our approach is ethnographic, immersive and sensing (Wiebe 2016). Thus, the lens we advance here also draws inspiration from knowledge democracy in order to centre diverse forms of expertise (Hall, Jackson and Tandon 2013). It is not our assertion that as privileged academics, we are the experts in the emergent field of water governance. Rather, we have much to learn from communities.

Water is porous. It moves. It flows. It connects. Thus, "it can help us to better understand the complex linkages between ourselves and others" (Tremblay & Harris 2018:

p. 175). The feminist lens of political ecology that informs our analysis brings together literature on environmental justice and ecofeminism while simultaneously centering corporeality and felt knowledge (Kimura 2015; Wiebe 2016; Schlosberg 2013; Gabrielson and Parady 2010; Shiva 2015). Furthermore, feminist political ecology has the potential to contribute to post-humanist conversations. The fluid, porousness of water signals the importance of connections between multiple forms of life, human and more-than-human. Feminist analyses have documented how bodies connect with the non-human environment in reciprocal and haunting ways (Gabrielson and Parady 2010; Haraway 2007; Lawrence and Wiebe 2017; Wall Kimmerer 2013; Wiebe 2016). Feminist methods further examine the ways in which struggles over access to resources, including water, are simultaneously emotional and material. Water carries nutrients, meanings and stories.

From our vantage points as feminist political ecologists, we extend this framework for analysis to the practical craft of policy making. Moving from theory to practice, we are interested in discussing the multiple ways in which storytelling methodologies can access diverse forms of knowledge and expertise while simultaneously impacting and influencing decision-making. To do so, the method advanced here employs arts-based participatory action research (Tremblay and Jayme 2015). It is storied, not static. We look at what moves people, and how and why they are moved to tell stories. Furthermore, we are concerned not just with the articulation or expression of stories, but also with the processes in place for meaningful engagement with community narratives that create space for not just hearing but also listening to situated voices. This not only entails a one-way avenue of listening, but also opportunities for the co-creation of knowledge as a shared, embodied, iterative and ongoing practice. As such, the researchers in this context serve communities as convenors of conversations and translators of knowledge for a range of audiences.

Specifically, the methodology applied here builds upon existing tools and techniques of arts-based participatory action and contributes water stories as community vignettes. These vignettes are sensory. They compel the listener or viewer to emotionally connect to a narrative and become attuned to the story. Vignettes are not isolated case studies or merely site-specific examples; they are narratives that include several multilayered components. For instance, sound, images and text.

Sounds may include voices of human and non or more-than-human components - i.e. the drone of a siren, the voice of a female activist reciting poetry, or a children's chorus chanting about a deep genealogical connection to place. Images can be still or moving. A community vignette is fluid, moving, relational and dynamic. They can reach a range of audiences, from community screenings to art galleries, public offices and interactive websites. An example of this type of community vignette is a music video, where community voices form an ensemble. Their harmonious convergence gives expression to the layered experience of being together while speaking about challenges and imagining alternative futures. These vignettes can also complement more formalized documentation of events presented in more conventional policy briefing formats. Bridging analytical and emotive worlds, community vignettes cite problems, centre community voices, and gesture to alternative ways of thinking, being and feeling.

Furthermore, we contend that these stories are more than "just stories" (Wiebe in press). While they deal with environmental justice, they are also to be considered as equally valuable to quantitative, statistical, epidemiological knowledge that traces large-scale trends over time. We wish to be clear here that we are not disparaging these methodologies; in fact, in order to address the complex, layered, sticky, tricky challenges of our time that transcend multiple jurisdiction, quantitative and qualitative approaches must work in tandem. The humanities and STEM fields have great potential to complement each other. Community vignettes can bridge these epistemological divides. The narrative-style format features multiple forms of data, science, knowledge and expertise. In addition to referencing numeric findings, they can also feature in-depth interviews and highlight the voices of those experiencing injustice and inequitable first-hand access to resources. Arts-based visual methods, such as participatory video, offer an example of this in theory, method and practice. This method is critical and it is creative. Not only does it challenge conventional modes of framing, but it serves to reframe relations of power. Our approach here thus draws upon the rich body of scholarship in feminist media studies to contribute to the advancement of prismatic media portraits (Lynes 2012), which casts light on problems from multiple angles of vision. Like a prism, we break apart a unidirectional beam of light to showcase a range of colorful visions, articulations and experiences. There is no one, singular, monolith-

ic story or narrative. Instead, we aim to problematize and contend with any coherent or hegemonic narrative and offer counter-stories. In addition, this prismatic lens brings together diverse perspectives, including those of public officials, academics, activists, community leaders and local residents.

Whether through poetry, music, videos, theatre or dance, bodies carry diverse forms of knowledge. Understanding this essential connection between emotion and reason has long been a feminist pursuit. We can turn to the pivotal work of indigenous feminist scholars like Diane Million who remind us of the significance of felt theory for robust political and ecological inquiry (Million 2013). As the next section discusses, with select community vignettes, these situated stories can help move beyond the monolithic, linear narratives that position marginalized citizens as in crisis and in need of protection or intervention. Rather, we emphasize agency and the stirring, moving elements of community organization and expression for radical social, political, economic and ecological change. These emotive, fluid, felt, artistic approaches to political ecology questions open up avenues for new ways of thinking, understanding and ultimately, we hope, policy dialogue. As a moving, fluid force, these water stories can deepen our human connections to broader ecologies of being-in-the-world, and contribute to a conversation about human/water relations based on connection, not ownership or possession.

Community Vignettes: Stories for Sustainable Futures

Clean, accessible water and sanitation for all citizens is essential, and a high global priority as outlined by UN SDG #6. Today, it is estimated that 783 million people worldwide lack access to clean drinking water and an additional 2.5 billion people have no access to improved sanitation – meaning that as much as 37% of the world's population cannot access basic water and sanitation (WHO/UNICEF 2015). This water crisis has mainly been caused not by a lack of supply or advancements in STEM, but rather is a consequence of failures in water governance. Castro (2007) describes water governance as the interactions around water, including those between governments, large businesses and

political parties, civil and other organizations representing sectoral interests, international agencies, NGOs and other relevant power holders. Inevitably these competing interests result in socio-political confrontations around how water and water infrastructures should be governed, and by whom. Therefore the development of governance practices and processes grounded in principles of sustainability and social justice “is one of the most urgent challenges facing water governance in the 21st century” (Castro 2007, p. 99).

Indeed STEM provides important infrastructural and engineering innovations for achieving the priorities as outlined in UN SGD #6 but it is also the governance and multifaceted dimensions related to power and privilege that are central to these local tensions and the attainment of local solutions. Recent research has focused on the many ways that policies relating to water use and access should be developed on the basis of consultations with local residents, including direct engagement with relatively impoverished populations on their water priorities and needs (Morales and Harris 2014; Goldin 2013). As such, participatory processes, including creative arts-based interventions, are being widely promoted on the understanding that citizen engagement in decision-making around water uses and conditions is essential, both to enliven democracy, to improve or conserve water resources, and to make better use of scarce public resources (Tremblay and Harris 2018; Rodina and Harris 2016; Goldin 2013). These processes carry with them the potential to speak multiple truths to policy decisions.

To illustrate some of our ideas, and drawing back to our watery subjectivity lens, we share insights on the role arts-based interventions such as Participatory Video (PV) can play in water governance through case studies with communities in underserved settlements of Accra, Ghana and Khayelitsha, South Africa. In particular, these examples shed light on the participants’ changing subjectivities through the research process and the important role emotions and empathy play, both in resource governance, and also in how we understand water and water infrastructures. Although we explored several themes and important insights from this work (please visit <http://watergovernance.ca> for further publications), for the purpose of this chapter we focus here briefly on how the participants themselves reflect on the creative participatory process as a vehicle for personal transformation, knowledge co-creation and a shifting sense of their own ‘watered’ subjectivity. Both sites,

Khayelitsha and Accra, however distinct, share a daily struggle for access to water and sanitation. As such, they share a common condition in terms of living in a locale with insufficient access to basic services, and with daily challenges related to securing water access, quality, affordability and linked concerns. As elaborated further below, the findings illustrate the particular shifting subjectivities and emotions among those who participated in the PV process, learning from their neighbors’ experiences of these issues, but also receiving benefits through direct engagement with the participatory video training and research.

At each urban site, a week-long training workshop was conducted involving leaders from partner organizations and members of their communities. In Khayelitsha this included 23 young participants between the ages of 19–23 (12 women, 11 men) who were selected by the partner organization. In Accra, the participants were selected by the partner organization ISODEC based on previous connections and experience with water and sanitation issues, and included 13 participants (8 government assembly representatives, 3 NGO representatives, and 2 community members from Teshie). As such, the two sites were distinct in that the Khayelitsha participants were youths (with no particular interest in water and sanitation), whereas the group in Teshie included NGO activists and local officials who had shared interest in and responsibility for water and sanitation in this community. The workshops weaved together diverse arts-based interventions and training in community-based research skills including developing ethical protocols, conducting interviews and post-production. The participants, now trained as co-researchers, conducted several interviews in their communities on issues related to water and sanitation over the course of an additional week followed by group co-editing sessions. The design of the project and themes in the videos materialized through the workshops and mutual collaboration (the final videos can be viewed at www.watergovernance.ca).

In each of the communities, focus groups were then conducted with local government officials working in water, sanitation and social development. The goal of this phase was to use the videos as tools to elicit feedback from those directly engaged in the policy realm. The videos served as a vehicle to share and amplify community voices, working to ensure that these perspectives were known to appropriate policy audiences. We also wanted to explore the ways that policy makers’ senses of these issues might shift through engagement

with the community videos. Final reflections were then captured with the co-researchers who had participated directly in the PV training. This enabled a deeper understanding of their own experiences and the impact of the process on their own senses of self (e.g. to assess senses of individual transformation), and the chance to critically assess the role of PV in community engagement and policy change. In particular, researchers asked how their understanding of and relationship to questions of water and sanitation had changed as well as what they personally had experienced and learned as part of the PV process.

The insights from this work, although only briefly outlined here, bring attention to the ways in which community-based interventions, and participatory video in particular, may help to uncover and identify knowledge and process gaps by enabling individuals and communities—often unheard—to participate in civic and political debates around water governance. This work illustrates how PV can be an effective and powerful tool for changing narratives around one's understanding of self and, in this context, water resources – towards a 'watery subjectivity'. The results suggest that creative and participatory video methods have strong potential to convey and evoke empathy and a range of other emotions. In addition, the results support claims with respect to the ways that video and critical arts-based interventions can serve as effective vehicles for personal transformation, dialogue about social difficulties and environmental justice, and knowledge co-creation (Tremblay and Jayme 2015; Wiebe 2015, 2016).

Conclusion, Discussion and Recommendations

To conclude, we wish to highlight the importance of addressing sustainable development from multiple perspectives, voices and angles of vision. From the prism of feminist political ecology, we propose what Wiebe (2016) refers to as a *sensing policy framework*, which centres the importance of citizens' lived-experiences and situated bodies of knowledge in policy processes, from design to the dissemination of findings. We also draw on empirical illustrations of arts-based participatory action research to document, visualize and give presence to embodied encounters between citizens, politics and water. In doing so, we suggest that, through these encounters, policy makers might build relationships with

affected communities and also be better equipped to explore alternative forms of communication that reflect diverse voices through creative public engagement. By acknowledging these changing narratives (and subjectivities) there is greater potential for decisions about water and sanitation to be more informed, inclusive and potentially accepted locally to address the pressing global sustainability challenges of our times.

References

- Castro, J. (2007). Water governance in the twentieth-first century. *Ambiente Sociedade X* (2), pp. 97–118.
- Goldin, J. (2015). Hope as a critical resource for small scale farmers in Mpumalanga. *Human Geography*, 8 (3), pp. 24–36.
- Gabrielson and Parady (2010). Corporeal citizenship: rethinking green citizenship through the body. *Environmental Politics*. 19 (3), pp. 374–391.
- Hall, B., Jackson, T. and Tandon, R. (2013). *Knowledge, Democracy and Action*. Manchester University Press.
- Haraway, Donna (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies*. 14, 3: 575–599.
- Haraway, Donna (2007). *When Species Meet*. Minneapolis: University of Minnesota Press.
- Kimura, Aya (2015). "Understanding Fukushima: nuclear impacts, risk perceptions and organic farming in a feminist political ecology perspective", pp. 260–273, in *The International Handbook of Political Ecology*, Raymond L. Bryant, ed. Cheltenham: Edward Elgar.
- Lawrence, J. and Wiebe, S. M. (2017). *Biopolitical Disaster*. London: Routledge.
- Lynes, Krista (2012). *Prismatic Media, Transnational Circuits: Feminism in a Globalized Present*. New York: Palgrave Macmillan.
- Morales, M., & Harris, L. (2014). Using Subjectivity and Emotions to Reconsider. Participatory Resource Management. *World Development*, 64, pp. 703–712.
- Million, Dian (2013). *Therapeutic Nations: Healing in an Age of Indigenous Human Rights*. Tuscon: University of Arizona Press.

Phare, M.E., Simms, R., Brandes, O.M & Miltenberger, M. (2017). *Collaborative Consent and Water in British Columbia: Towards Watershed Co-Governance*. Report prepared by POLIS Water Sustainability Project, University of Victoria. Retrieved from: <https://poliswaterproject.org/polis-research-publication/collaborative-consent-water-british-columbia-towards-watershed-co-governance/>

Rodina, L. and Harris, L. (2016). Water services, lived citizenship, and notions of the state in marginalised urban spaces: The case of Khayelitsha, Cape Town, South Africa. *Water Alternatives* 9(2): pp. 336-355.

Shiva, Vandana (2015). *Earth Democracy: Justice, Sustainability and Peace*. North Atlantic Books.

Schlosberg, David (2013). Theorising environmental justice: the expanding sphere of a discourse. *Environmental Politics*. 22, 1: pp. 37-55.

Tremblay, C., & Harris, L. (2018). Critical engagements: empathy, subjectivity and changing narratives of water resources through participatory video. *Geoforum*, 90: pp. 174-182.

Tremblay, C., Jayme, B. (2015). Community knowledge co-creation through participatory video. *Action Research*. 13 (3), pp. 298-314.

Wiebe, S.M. (2015). "Decolonizing Engagement? Creating a Sense of Community through Collaborative Filmmaking", *Studies in Social Justice*, special issue on "Scholarship and Activism". 9 (2): pp. 244-257.

Wiebe, S.M. (2016). *Everyday Exposure: Indigenous Mobilization and Environmental Justice in Canada's Chemical Valley*. Vancouver: UBC Press. *Winner of the Charles Taylor Book Award, 2017*.

Wiebe, S. M. (in press) "Just' Stories or "Just Stories?: Mixed Media Storytelling as a Prism for Environmental Justice and Decolonial Futures", *Engaged Scholar Journal*. Issue 9.

Wall Kimmerer, R. (2013). *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*. Milkweed Editions.

WHO/UNICEF (2015). Water Sanitation and Hygiene: Introduction. Retrieved from: <http://www.unicef.org/wash/>

2. A Humanistic and Integral Approach to the Teaching and Learning of Mathematics

D.B. Lortan and S.M. Maistry

Introduction

The Incheon Declaration's⁽⁹⁾ (2015) stated vision for education is to “transform lives through education” (UNESCO 2015, p. 6). It commits to an education agenda that “is holistic, ambitious and aspirational, leaving no one behind” and this new vision is fully captured by the proposed SDG 4 which aims “to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all” (UNESCO 2015, p. 6). Clear and flexible learning pathways are an important measure towards achieving the Sustainable Development Goals (SDGs) and specifically SDG4 in relation to Technical Vocational Education and Training (TVET) Colleges. Ananiadou, Field and Chakroun (2018) emphasise that TVET programmes have typically been designed so that they can provide skills for specific trades or occupations: these skills are often not easily transferrable to different learning or occupational contexts, which create a challenge for potential students. The authors point out that the international community is aware of these issues and consequently the need to develop flexible and clear learning pathways is reflected in the Education 2030 Agenda SDGs of the United Nations Educational, Scientific and Cultural Organisation.

It is of relevance and significance to this paper that the Incheon Declaration is underpinned by a lifelong learning approach and a humanistic vision of education and development based on human rights and dignity; social justice; inclusion; protection; cultural, linguistic and ethnic diversity; and shared responsibility and accountability. Members of the South African Knowledge for Change (K4C⁽¹⁰⁾) Hub located at the Durban University of Technology (DUT) have participated in research collaboration between the South African Qualifications Authority (SAQA) and DUT. This investigation entitled *Developing an Understanding of the Enablers of Students Transitioning between Technical Vocational*

Education and Training (TVET), Higher Education Institutions and the workplace has focussed on the mobility of students between TVET Colleges and Universities of Technology (UoTs). One of the primary aims of the project was to identify, analyse and document successful models and relationships for student transitioning between TVET Colleges and UoTs, in order to create a baseline of practices. The study further explored articulation as the pathways followed by individuals as they progress, and the means by which they are supported in their learning and work by institutions that are flexible in their admission, curriculum, learning and teaching, and learner support systems.

One of the case studies in this larger research partnership is the Jirah Project, which focuses on enablers of individual articulation pathways for second chance learners who want to obtain entrance into post school education such as TVET Colleges and Universities but have been prevented from doing so for a variety of social, economic and personal reasons. For example, learners from dysfunctional backgrounds have limited access to higher education and may be demotivated by their circumstances and lack the confidence and self-esteem to continue with further education. Savelsberg, Pignata and Weckert (2017) found that being a *Not in Education, Employment or Training* (NEET) individual is not an isolated event. It is usually the result of a combination of interrelated factors that lead young people to disengage from and drop out of school.

Within the broader SAQA_DUT investigation, the Jirah case study sought to explore the factors that contribute to the success of the model and whether the model could be replicated and taken to scale. In this context, success refers to the reported improved individual and collective performance of a cohort of second chance learners on the Jirah Project. Many of the students, who had performed poorly in Mathematics at high school, improved their performance in the nationally moderated Mathematics courses for which they registered through the Jirah Project. Some even obtained distinctions. This paper describes the case study and explores

9. http://uis.unesco.org/sites/default/files/documents/education-2030-incheon-framework-for-action-implementation-of-sdg4-2016-en_2.pdf

10. <http://unescochair-cbrsr.org/index.php/k4c-2/>

the approach adopted by the Jirah Project in mitigating the psychological and situational barriers that surface in the teaching and learning of Mathematics, in particular to second chance learners. The findings highlight: the notion of interdependency between the individual and the collective and between competition and collaboration among students; the co-construction of knowledge between students and between students and teachers; and the leadership that underpins the teaching and learning of Mathematics within a humanist/humane philosophy. In its conclusions, the paper reveals that an integral approach to the teaching and learning of Mathematics to second chance learners has a positive impact on the holistic lives of students if underpinned by a humanistic/humane philosophy, thereby giving effect to the aim of SDG4 as mentioned above.

The South African Education Context

The democratic government of South Africa post 1994 recognised and committed itself to the urgent need for transformation of education generally and higher education in particular. The introduction of the Higher Education Act of 1997 (Republic of South Africa, Department of Education 1997) served as the foundation and provided guidelines for higher education institutions (HEIs) to uphold the new goals of HEIs in a democratic South Africa and to ensure that non-racial, non-sexist and socially just values were upheld. However, despite the legal and policy changes in the country, indications suggest that many challenges still exist in contemporary South Africa with regards to education and higher education in particular (Republic of South Africa, Department of Higher Education and Training 2013).

Reports by Spaul (2013), Spaul (2017) and Roodt (2018) indicate that most South African learners cannot read, write or compute at grade-appropriate levels, with large proportions being functionally illiterate and innumerate. They further reveal that as far as educational outcomes are concerned, South Africa has the worst education system of all middle-income countries that participate in cross-national assessments of educational achievement, scoring last among 50 countries in reading. Many learners proceed to higher grades without acquiring foundational skills in numeracy and literacy (Spaul 2013). When sustained over the lifespan from primary school through high school, this practice leads to learn-

ers failing and dropping out of schools in large numbers in Grades 10 and 11 (South African Umalusi, Council for Quality Assurance in General and Further Education and Training 2016). As a result, these students (which include second chance learners) end up at the bottom of the system and struggle to access Higher Education as they do not meet the requirements.

The Department of Higher Education and Training (DHET) (Republic of South Africa, Department of Higher Education and Training 2017) states that approximately fifteen million persons aged 15-64 (40.3%) were NEET in South Africa in 2016. Factors contributing to the NEET scenario might include disability; family structure (not living with biological parents or grandparents); orphanhood; and being eligible for a foster grant from the government but not accessing social welfare due to social demographics. Living in isolated communities, especially rural areas and townships, combined with poverty, can make young people more vulnerable to becoming a NEET individual.

The issues of quality, readiness levels, progression, access and success of students from primary school throughout the post-schooling environment continue to be a challenge. This makes it hard for learners from disadvantaged backgrounds to enter the system as they have already been disadvantaged by the school's education system (Maringe and Osman 2016). Public schooling in South Africa is characterised by dysfunctionality. The South African Human Rights Commission report (2006) notes that "dysfunctionality, vulnerability, alienation and a lack of social cohesion characterise many of the townships and rural schools". Second chance learners will be required to navigate these issues as well as facing the daunting task of 'starting again.'

Kgobe and Baatjes (2014) have observed that "student progression and transfer between TVET Colleges and universities remain limited due to a range of epistemological, institutional, psychological and situational barriers." According to Hay and Marals (2004) high school graduates entering higher education are struggling to cope with the demands placed upon them, suggesting that they are not adequately prepared for learning at this level. If high school does not prepare learners for higher education at their first attempt, then it is unlikely to adequately prepare those who attempt to access higher education for the second time.

In this context, the Jirah Project has positioned itself to offer second chance learners the opportunity to gain access to further education in the South African PSET system and excel in their various careers. Ross and Gray (2005) intimate that second chance education is based on the idea that through an organised structure an individual can actualise an educational opportunity missed or failed the first time around. Second chance learners need opportunities to be created for them that will allow them to enter HEIs for what is termed as 'second chance education'. One such opportunity, engendered by the Jirah Project, a community partner of the DUT, has enabled the success of second chance learners in furthering their education in Technical and Vocational Engineering Studies, and to enter the workplace. To assist in alleviating this problem, the Engineering bridging programme of the Jirah Project was designed to enable learners to articulate into the mainstream after completing this course. The teaching and learning of Mathematics is an important component of the bridging programme.

Second Chance Learners and the Jirah Project

Twao et al. (2007) note that literature on second chance learners in general is limited, and that what is available tends to focus on immigrants and literacy. Even less research has been conducted on second chance learners in the South African context, specifically in relation to articulation – and even less so in the context of navigating the landscape of STEM and specifically the teaching and learning of STEM within a humanist philosophy.

One of the biggest challenges South Africa is facing is the expansion of access to education and training to enable equal opportunities for individuals who wish to follow different learning pathways, including those who did not complete their schooling, making them second chance learners (Republic of South Africa, Department of Higher Education and Training 2013), which include those who have returned to learning later in life in order to gain employment (Twao et al. 2007), and those returning to improve their qualifications in order to be promoted in the workplace (Robertson 2013).

There are various factors that lead learners to be deemed second chance learners. From the primary school phase, learners have experienced challenges

with reading and writing, making it hard for them to understand what they are being taught (Chisholm 2011). Motala and Dieltiens (2010) point out that due to learners being frustrated with their studies, a high number of repetition rates in the lower grades and a high drop-out rate in the higher grades occur, due to which learners become over-aged learners and end up being high school dropouts. Strassburg, Meny-Gibert and Russell (2010) conducted a survey which established that ten per cent of their sample of out-of-school youths aged 16–18 spoke of repeating a grade as a catalyst for leaving school. Some also mentioned problems associated with being older than their classmates (being embarrassed about their age, being teased or humiliated by educators or other learners).

The Jirah Project, established in 2012, is a community-based college that operates as a Non-Profit Organisation (NPO). It provides 'fees-free' education, serving youths in need of a 'second chance' to further their studies and gain access to the PSET system. The project also offers a second chance to people with learning disabilities. The high school results of these learners ordinarily do not meet the requirements of HEIs (Badat 2010). In many cases, the circumstances of the learners applying to access Jirah are more of a deterrent than their academic performance.

Against this background, the Jirah Academy as part of the Jirah Project was established in 2012 to offer opportunities for NEETs to access education and training and ultimately the workplace on the principle that hard work and discipline are a precursor to success.

It is noteworthy that the relationship between Jirah and DUT, which Jirah initiated, predates the work of the SAQA-DUT Articulation Project. Jirah volunteered to be a partner in the broader research project. In this capacity, they were able to steer the direction of inquiry from a participatory action research (PAR) approach.

Theoretical Framework

This case study utilised the theoretical framework adopted by the broader SAQA-DUT research project, i.e. the Constructivism Theory of Learning, which proposes that people learn best by building on their own existing knowledge and understanding, which is influenced by their previous experiences (Bada and Olusegun 2015), which encourage students to go beyond what is required of them. Bruner (1966) believed that instructors/teachers should structure their curriculum in such

a way that students continually build on what they have already learned and teachers should involve their students in active dialogue and encourage them to make their own discoveries. This is also known as active learning, where the teacher is viewed as the facilitator who guides learning (Busbea 2006). The broader study utilised the lens of this learner centred approach to second chance learners in the exploration of the factors contributing to the success of the Jirah model.

The case study also adopted an integral approach to education, which focuses on developing the mind, body and spirit of students and the creation of an enabling environment to make responsible life choices. Integral Education encourages holistic development by including emotional, moral, interpersonal, physical, spiritual and cultural development aspects (Sri Aurobindo 1997). It provides for the inclusion of indigenous knowledge values that promote individual and collective development. Partho argues that the integral educator does not educate discrete parts of the student, unlike the educator in a mechanistic education system whose focus is mainly on the head. Instead, the student is “integrally the head, heart, the senses and the body, and more” (Partho 2007), suggesting the aptness of integral education for social responsibility. Integral Education offers an opportunity to ameliorate past failings by including all human dimensions, focusing on the relationship between the individual as part of the collective. Since integral education focuses both on each unique individual and on each individual as a part of human society and the entire manifestation of life on the planet, it involves the weaving of the individual’s journey of unfoldment with his or her social identity and development. Toward this end, educational experiences are connected in age-appropriate ways to the central issues of our day, including justice, peace, ecological wisdom and sustainability – all of our moral responsibilities as humans (Marshak 2015). Adams (2006) asserts that “one of the purposes of creating a pedagogical model that integrates the emotional, spiritual, physical and mental intelligences from conception to graduation is to educate for a different quality of person”. Both the Constructivism Theory of Learning and Integral Education frameworks are resonated to varying degrees in the Jirah case study.

The Research Process

As mentioned above, in the context of the broader investigation, the Jirah Academy case study sought to explore the factors that contributed to the success of the model, i.e. the improvement in students’ results in Mathematics at Jirah and whether the model could be replicated and taken to scale. Data was collected through individual and group interviews using the narrative approach, which is based on the assumption that a person’s living world can best be understood from his or her own account and perspective and the focus is on individual subjective definitions and experiences of life (De Vos et al. 2011). According to Creswell and Plano Clark (2006) narrative is understood as a spoken or written text giving an account of an event/action or series of events/actions, connected chronologically. An oral history consists of gathering personal reflections on events and their causes and effects from one individual or several individuals (Plummer 1983). The narrative approach was chosen to gain an in-depth understanding of the experiences and life lessons of the people involved in the Jirah project. Data was collected from June 2016 to July 2018, during which period eight individual interviews and four group interviews were conducted. The four groups comprised thirteen, five, three and four students respectively.

The questions asked of the students focused on how they cope with being described as second chance learners, and what they were doing differently in all areas of learning in the bridging programme courses but specifically in Mathematics, so as to prevent a repeat of their performance at high school and, based on their experiences, the aspects of the approach to teaching and learning that they would change if possible.

Data was analysed using narrative analysis. Frost et al. (2010) explains that this method is based on the understanding that people use stories to make sense of themselves and their world by making sense of their life experiences. Data for this broader research was analysed to categorise common knowledge into various groupings. Braun and Clarke (2006) define thematic analysis as a method for identifying, analysing and reporting patterns within data. The recorded data from the interviews was transcribed and common themes and sub-themes were identified.

Research Findings

Students Perceptions of being described as Second Chance Learners

The students believed that the term 'second chance learners' was viewed as a negative connotation by the external environment. However, for the students, 'second chance' was an opportunity for them to make changes to their lives and take control of their destinies. They reflected on the positive changes that each of them had made to their lives.

Students' change in approach to learning from high school experiences

The students rose to the challenge by 'eating, drinking and sleeping' their studies, especially on difficult courses like Mathematics. They used this as a means by which to separate themselves from the influences that pervaded their neighbourhoods: drugs, alcohol, gangs and the concomitant decay in self-worth and self-confidence. They reported regularly meeting on weekends. They avoided the weekly revelries to which they were invited, choosing to help each other by teaching and learning from each other. The notion of interdependency between the individual and the collective, and between competition and collaboration, was put into action as each group member took responsibility (within reason) for everyone else. They afforded each other multiple opportunities to teach or reteach sections of the syllabus. Each unanswered question during these work sessions represented a gap in the knowledge of the person to whom the question was posed. The group then undertook not to move on until that gap was addressed. On the rare occasions that a question remained unanswered, the issue was brought to the teacher's attention. Over the semester, the collective performance of the group improved, with many outstanding individual performances reported. While the Mathematics was not new, it was organised and represented in a manner with which the students were comfortable. While the weekly incentives provided by the Jirah management to boost individual performances raised the competitive attitude, the group understood that their collective performance in the national level examination directly impacted the future funding of the Jirah Project. A form of co-ownership of the Academy encouraged cooperation and collaboration between the students. By responding in this manner, the students raised their own levels of enthusiasm for a recognisably difficult subject and in

so doing answered an age-old question that their elders had been asking for decades: how do we keep young people off our dangerous streets?

A number of students' responses acknowledged that the changes in their approach to life and learning had come about as a result of the inspirational leadership of the Jirah Academy. As much as students were encouraged to perform on their courses, their self-development as good human beings who needed to be confident about life's challenges was equally important. The founder and director of the Jirah Project saw to it that the students' learning on all the courses in the Engineering Bridging Programme, including Mathematics, was underpinned by a humanist philosophy. Weekly sessions on aspects of discipline (which usually feature in discourses in the Humanities) were covered with the students. From the knowledge gained in these sessions, students, wittingly or unwittingly, put into effect what in the South African context is known as the Ubuntu philosophy, which is further described in the discussion section of the paper.

Changes to Jirah Academy and themselves

For a few students, the discipline at Jirah Academy was a huge challenge while for most of the students it helped them to stay focused and think about their future. They were aware of the changes in their own outlooks to life and the positive impact of changes to their self-development. A number of the respondents came from backgrounds plagued with the worst ills in their communities. For many, the second chance was a second chance at life. The majority of the student cohort completed their studies, were placed in apprenticeship or internships, or were employed; others continued their studies. Their livelihoods and lived experiences (their repositories of knowledge) have grown exponentially, and this new knowledge has been co-constructed with them, for them and for the neighbourhood in which many of them still reside.

Discussion and Conclusion

Mathematics is in and of itself a difficult subject and/or discipline, even for those who have developed an appreciation or fondness for its rigour. For most of the NEETs who were given a second chance at education under the auspices of the Jirah Academy, it was the most dreaded subject and they had to take a class in

it for each semester of the course. One of the ways to unfurl the notion of the Constructivism Theory of Learning was to explore the impact of an Ubuntu approach to the learning of Mathematics. The philosophy of Ubuntu - 'people are people though other people' - when slightly adapted becomes 'I am successful because of the contributions of others.' Students were encouraged to learn *with* each other, *for* each other and *from* each other. A competitive and collaborative approach was inculcated through which collective performance became as important as individual performance.

Essentially, further funding for the Academy was contingent upon collective performance, while student progression along the learning pathway was based on individual performance. This point was illustrated in a mathematical metaphor: The Role of the Mean in Meaningful Mathematics. If in the spirit of Ubuntu performances are interdependent, then a shared sense of responsibility to raise the mean performance of the collective by focusing on improving all individual performances should be a consequence.

Literature shows that learning is a human activity that requires the integration of the body, mind and soul (spirit) as posited by the integral approach to education. That the leadership of Jirah is aware of this approach is demonstrated by the fact that the teaching and learning of the Engineering Bridging Programme and particularly Mathematics is integrated with subjects/disciplines from the Humanities and embedded within the philosophy of Ubuntu. Through these subjects, students have gained an appreciation of the social, cultural, historical and ethical context of their roles in their homes, communities and jobs. Learning and development of the self is enhanced through this process, which is manifested in their performances in the nationally moderated examination and the work ethic reported by their line managers, supervisors and mentors in the internship/apprenticeship programmes that they have been admitted to.

In conclusion, the vision for education outlined in the Incheon Declaration (2015) is to "transform lives through education" (UNESCO 2015, . 6). An education agenda that "is holistic, ambitious and aspirational, leaving no one behind" makes the goal of the proposed SDG 4 "to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (UNESCO 2015, . 6). feasible. The Jirah Project has encompassed an integral approach to the teaching and

learning of Mathematics to second chance learners. This approach has had a positive impact on the holistic lives of its students and in some measure has given effect to the aim of SDG4.

References

- Adams, A. (2006). *Education: From conception to graduation. A systemic, integral approach* (Doctoral dissertation, California Institute of Integral Studies).
- Ananiadou, K., Field, S. and Chakroun, B. (2018). Learning Pathways: International Trends in Articulating Vocational and Post-Secondary Education. *SAQA Bulletin. Articulation Initiatives*. 18 (1) pp. 107-115. Waterkloof: South Africa.
- Aurobindo, S. (1997). Complete Works of Sri Aurobindo, vol. 20. *The Renaissance in India*, Sri Aurobindo Ashram Trust, Pondicherry.
- Bada, S. O. and Olusegun, S. (2015). Constructivism learning theory: A paradigm for teaching and learning. *Journal of Research & Method in Education*, 5(6), pp. 66-70.
- Badat, S. (2010). The challenges of transformation in higher education and training institutions in South Africa. *Development Bank of Southern Africa*, 8, pp. 1-37.
- Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), pp. 77-101.
- Busbea, S.D. (2006). The effect of constructivist learning environments on student learning in an undergraduate art appreciation course. (Doctoral dissertation, University of North Texas).
- Chisholm, L. (2011). Skills and education-Review: The challenge of South African schooling: dimensions, targets and initiatives. In: Hofmeyr, J. Ed. *Transformation Audit: From Inequality to Inclusive Growth*. Cape Town: The Institute for Justice and Reconciliation. (pp 47-50).
- Creswell, J. W. and Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Los Angeles: Sage publications.
- De Vos, A. S., Delpont, C. S. L., Fouché, C. B. and Strydom, H. (2011). *Research at grass roots: A primer for the social science and human professions*. Van Schaik Publishers.

- Flynn, C., & McDermott, F. (2016). *Doing research in social work and social care: The journey from student to practitioner researcher*. London: Sage.
- Frost, N., Nolas, S. M., Brooks-Gordon, B., Esin, C., Holt, A., Mehdizadeh, L. and Shinebourne, P. (2010). Pluralism in qualitative research: The impact of different researchers and qualitative approaches on the analysis of qualitative data. *Qualitative research*, 10(4), pp. 441-460.
- Hay, H. R. and Morales, F. (2004). Bridging programmes: gain, pain or all in vain: perspectives on higher education. *South African Journal of Higher Education*, 18(2), pp. 59-75.
- Kgoebe, P and Baatjes, I. (2014). A review of education and training in South Africa. *Post-School Education Journal*, 1 (1), p.2.
- Maringe, F. and Osman, R. (2016). Transforming the post-school sector in South Africa: Limits of a skills-driven agenda. *South African Journal of Higher Education*, 30(5), pp. 120-140.
- Marshak, D. (2015). What is integral education? in About Self Design, Faculty Insights, News, Post-modern and Integral Learning. Available: www.holisticedinitiative.org/wp-content/.../david_marshall-integral_education.
- Mkonto, P. N. (2010). *The development and evaluation of a learning styles assessment tool for the South African higher education context* (Doctoral dissertation, University of the Western Cape).
- Mkwanazi, S. and De Wet, N. (2014). School dropout among African adolescents in South Africa: Is there any gender differential. *University of Witwatersrand: South Africa*.
- Motala, S. and Dieltiens, V. (2010). *Educational access in South Africa: Country research summary*. Consortium for Research on Educational Access, Transitions and Equity.
- Partho. (2007). *Integral Education A Foundation for the Future*. Pondicherry, India: Sri Aurobindo Society.
- Republic of South Africa. Department of Education. (1997). Higher Education Act, 1997: Regulations for the Registration of Private Higher Education Institutions. Government Gazette 24143: 13 December 2002. Pretoria: Government Printer. Available: <http://www.dhet.gov.za/Management%20Support/Higher%20Education%20Act,%201997-%20Regulations%20for%20the%20registration%20of%20Private%20Higher%20Education%20Institutions.pdf> (Accessed 11 May 2017).
- Republic of South Africa. Department of Higher Education and Training. 2013. White paper for Post-School education and training: building an expanded effective and integrated Post-School system. Pretoria: Department of Higher Education and Training.
- Republic of South Africa. Department of Higher Education and Training. 2017. Fact Sheet on NEET. Pretoria: Department of Higher Education and Training. Available: <http://www.dhet.gov.za/Planning%20Monitoring%20and%20Evaluation%20Coordination/Fact-sheet-on-NEETs-Final-Version-27-Jan-2017.pdf> (Accessed 29 May 2018).
- Robertson, P. J. (2013). The well-being outcomes of career guidance. *British journal of guidance & counselling*, 41(3), pp. 254-266.
- Roodt, M. (2018). The South African education crisis: Giving back to parents. *South African institute of Race Relations: 7*.
- Ross, S. and Gray, J. (2005). Transitions and re-engagement through second chance education. *The Australian Educational Researcher*, 32(3), pp. 103-140.
- Plummer, K. (1983). *Documents of life: An introduction to the problems and literature of a humanistic method*. London: Allen & Unwin.
- Savelsberg, H., Pignata, S. and Weckert, P. (2017). Second Chance Education: Barriers, Supports and Engagement Strategies. *Australian Journal of Adult Learning*, 57(1), pp. 36-57.
- Spaull, N. (2013). South Africa's education crisis: The quality of education in South Africa 1994-2011. *Johannesburg: Centre for Development and Enterprise*, 1-65. Available: <http://sifundakunye.org/wp-content/uploads/2016/02/south-africa-education-crisis-2013.pdf> (Accessed 25 April 2017).
- Spaull, N. (2017). The unfolding reading crisis: The new PIRLS 2016 results. *Besoek op, 15*. Available: <https://nicspaull.com/2017/12/05/the-unfolding-reading-crisis-the-new-pirls-2016-results/> (Accessed 10 October 2018).
- Strassburg, S., Meny-Gibert, S., & Russell, B. (2010). *Left unfinished: Temporary absence and drop-out from South African Schools*. Social Surveys Africa.
- Tracy, J. (2013). *Qualitative Research Methods*. 1st ed. Chichester: Blackwell.

The South African Human Rights Commission. (2006). Report of the Public Hearing on the Right to Basic Education. South Africa: South African Human Rights Commission. Available: www.sahrc.org.za (Accessed 6 August 2018).

The South African Umalusi Council for Quality Assurance in General And Further Education and Training. (2016). Policy and criteria for the quality assurance, accreditation and monitoring of independent schools and private assessment bodies. Department of Basic Education. Available: <https://pmg.org.za/committee-meeting/13477/> (Accessed 6 April 2017).

Tawo, R. E., Asim, A. E., & Basse, P. U. (2007). Methodological Issues in Assessing Literacy Level among Second Chance Learners. *International Journal of Learning*, 14(3).

UNESCO. (2015). *Incheon Declaration: Education 2030: Towards inclusive and equitable quality education and lifelong learning for all*. Incheon: UNESCO.

Van der Berg, S. (2011). Low education quality as a poverty trap: Introduction and welcoming. *Unpublished presentation. Programme to Support Pro-Poor Policy Development, University of Stellenbosch*.

3. Urban Planning with Communities and Stakeholders: The Need to Transcend Disciplinary Boundaries

Kaustuv K. Bandyopadhyay and Madhura Yadavv

Introduction

It is nearly impossible to capture the many facets of the human imagination and well-being in a single policy. However, policy makers and policy managers need some tools to plan and measure human progress globally and locally. Human progress is intrinsically embedded in its social, cultural, economic, political and environmental surroundings. The 2030 Agenda⁽¹¹⁾ and its 17 Sustainable Development Goals (SDGs), adopted in 2015, provide a comprehensive, coherent and holistic framework for the well-being of the earth and its inhabitants. It recognises the interconnectedness of lives and their support systems, which makes the SDGs disruptive and transformative enough to encourage the global community to move away from business as usual. The new consensus that transcends the onus of responsibility and accountability to achieve the SDGs includes not only the institutions of global governance and national governments, but a whole array of other institutions, including the private sector, civil society and higher education.

SDG 11 focuses on “Making cities and human settlements inclusive, safe, resilient and sustainable” and SDG 6 pledges to “Ensure availability and sustainable management of water and sanitation for all”. Achieving both these Goals will be significant for the urban poor living in slums and informal settlements in India. The momentum of urbanisation in India is unparalleled. According to the 2011 Census⁽¹²⁾, 377 million people were living in India’s cities, and 2030, it is estimated that more than half of the population will be. While it is difficult to obtain authentic and consistent data on the extent of urban poverty, in 2014-15 an estimated 140 million (nearly 35 per cent) of the urban population were considered to be poor. In 2012, there were an estimated 33,510 slums in India with approximately 8.8 million households.

In India, rapid urbanisation has led to a strain on public services, in particular sanitation services. The state of urban infrastructure and delivery of public services is highly unsatisfactory, and is far short of what is required to sustain inclusive and sustainable economic growth. The abysmal lack of sanitation services is omnipresent in Indian cities and poses an extraordinary threat to the health and hygiene of the population, particularly the poor who live in informal settlements within cities. The 2011 Census showed that close to 8 million, or 12 per cent, of urban households did not have access to toilets and defecated in the open. Another 8 per cent used public and shared toilet facilities that are unclean and unhygienic. Open defecation in urban settings with high population densities and untreated sewage is the biggest source of water pollution in India. Lack of safe spaces poses further challenges, as it affords little dignity and grave security risks for women.

Access to sanitation services, including household, public and community toilets with water facilities, connection to either onsite or networked sewage disposal systems and scientific solid waste management are pre-requisites for the inclusive and sustainable growth of Indian cities. Clean and sanitary surroundings will positively impact the health of the city’s residents, the urban poor in particular. With better health leading to fewer losses in productivity for the urban poor, they would be able to participate more effectively and benefit from the economic opportunities that arise from growth in a city’s economy.

Two flagship programmes, Swachh Bharat Mission – Urban (SBM-U) and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) –were launched in 2014 and 2015 respectively by the national government to address the sanitation woes faced by the urban poor. Several million new toilets have been constructed since the launch of the programme; however, their optimal usage is still questionable.

11. <https://sustainabledevelopment.un.org/post2015/transformingourworld>

12. Download file at <http://censusindia.gov.in/2011-Documents/UAs-Cities-Rv.ppt>

This paper studies the efforts by communities, civil society organisations and universities to transcend the limited disciplinary expertise and specialisation that has been considered as the epitome of higher education for so long. It examines two illustrative case studies – first, the joint efforts by Participatory Research in Asia (PRIA) and the urban poor communities from informal settlements in various Indian cities to make public sanitation services responsive to and inclusive of urban poor; and second, an attempt by a university to engage with urban municipalities to undertake inclusive planning.

Case study 1

Background

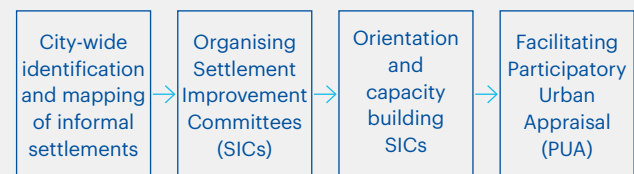
A major reason for continued and perpetuated deprivation of the urban poor is their invisibility or under-visibility in the eyes of city authorities responsible for providing them with sanitation and other services. At times, this oversight by city authorities is due to sheer ignorance, sometimes deliberate, and at other times due to their lack of capacities. This invisibility means lack of access to safe drinking water and sanitation, among other services – all of which traps them in the vicious circle of poverty. How can the urban poor find a way to make themselves visible to the city authorities? Many such communities across the regions have found an answer to this question in organisation building and self-enumeration.

PRIA has been implementing a multi-year and multi-locational programme called “Engaged Citizens, Responsive City (ECRC⁽¹³⁾)” in three Indian cities – Ajmer (Rajasthan), Jhansi (Uttar Pradesh) and Muzaffarpur (Bihar). This programme seeks to enhance the capacities of the urban poor to participate in planning, implementation and monitoring of public sanitation services offered through SBM-U and AMRUT. Both these programmes intend to provide access to water and sanitation services to the urban poor but face challenges with the proper targeting of households. This challenge has arisen out of the fact that data is a critical requirement to effectively seek interventions from the city authorities, but is usually scarce at the granular level. Data sources like the Census are difficult to utilise for planning purposes because collection is decennial and information at the level of informal settlements/slums is not always provided. Such

limitations deter citizen participation, and specifically that of the urban poor, as the lack of access to data prevents understanding or monitoring of real situations on a local level. For cities to develop, and for informal settlements to have better access to basic services, close coordination between the urban poor, city authorities and other stakeholders, including local academic institutions, is critical. PRIA believes that one of the first steps towards participatory planning and decision-making is to empower communities with critical data.

Methodology

As in any participatory research, a prerequisite was an organised community willing to know about its reality, the root causes of this reality, and what community and other stakeholders can do to change it. PRIA undertook several interventions as described in what follows in order to raise awareness among the community, organise them, and prepare the community leaders take ownership of the planning and monitoring of the implementation of public sanitation service programmes.



City-wide identification and mapping of informal settlements: A process of mapping and listing informal settlements was organised in all the cities. In this exercise, settlements were physically identified and plotted on a map. Basic information regarding the legal status of each settlement was collected as well. While this exercise began by gathering secondary data and records on notified and non-notified slums, the PRIA team did not restrict this process to settlements that were recognised by governments and state authorities alone. Information on informal settlements available from city authorities/agencies is often outdated. As a result, people are often found living in unrecorded settlements. The mapping process provided for first-level interaction with the communities living in these settlements. It helped to identify the active citizens and leaders of the community, along with other Community-Based Organisations (CBOs).

Organising Settlement Improvement Committees (SICs): SICs are organisations of the urban poor. Community organisation was a prerequisite for designing

13. <https://pria.org/projectsdetails-engaged-citizens-responsive-city-30-549>

and executing a PSE exercise. Joining hands with the communities for such processes ensures the inclusion of local knowledge and the collection of authentic data. When a community enumerates, evaluates and monitors itself, the sustainability of the positive changes increases. A sense of ownership emerges, unlike situations where unknown third parties undertake the same processes. Community participation holds high importance for generating real-time, validated data from the field, where the enumerators are themselves inhabitants of the slums being enumerated, apart from being aware of local contexts, formal/informal arrangements and the people. Community organisation processes are aimed at the formation of local institutions that advocate for the interests and needs of the urban poor. The ECRC project created 250 SICs in the three project cities. These were developed and managed by the residents of these settlements with the aim of providing a safe space for discussing and reflecting on the settlement's problems, identifying community needs, and finding solutions to these problems and needs by working with other institutions. SICs are representative bodies established with nominated residents of the informal settlement. Each SIC has a total of 8-15 core members. The project made a conscious effort to encourage the involvement of young people and women as members of these committees. When facilitating the formation of SICs, PRIA facilitators sought to ensure the engagement of all households in the settlement. To ensure sustainability of the SIC, caste, class, gender and age barriers needed to be broken.

Orientation and capacity building of SICs: After the formation of SICs, the PRIA team provided regular mentoring and coaching to support the core members. Regular meetings were held with each SIC to understand the nature of their problems, priorities as well as ideas on how to solve these issues. Concurrently, the team prepared profiles of each SIC member to assess their learning needs. Based on this, orientation and training programmes were designed to create an understanding of the role of the SIC, as well as the rights of residents of these settlements. These orientations were planned in three to four rounds of short, interactive sessions and were conducted in a participatory manner focusing on topics such as the need for community organisation, leadership development, community meetings, etc. The orientation sessions were organised for a cluster of SICs (with three to four SICs in each) and helped the SIC members to broaden their perspective

of the issues/problems faced by informal settlements and to deal with them in a more informed and constructive manner.

As the SICs advanced, core members were nominated to participate in the orientation sessions run by PRIA, and which furthered their understanding and built on their existing knowledge, while providing for leadership development, the articulation of problems, and the role of city authorities and other state agencies. Some SIC members became interested in conducting PSE along with the selected enumeration team, and the trainees in the PSE method became involved in the subsequent processes.

Facilitating Participatory Urban Appraisal (PUA): PRIA used PUAs - a participatory research method used for mobilising communities, understanding local contexts, raising awareness and building a collective understanding of the issues faced by residents of informal settlements. Communities are often reluctant to interact with outsiders. This process, however, was essential because of its non-threatening and non-extractive approach. It ensured a collective learning process for the community and broke the power barriers. The PRIA team undertook **Transect Walks** with members of the community to collectively form an understanding of the informal settlement by identifying its location, geographical spread, housing conditions, and availability of services. These walks were used as a point of entry, allowing the team to 'observe' through the eyes of local people, and help to build a rapport with the community. The **Timeline** tool provided a historical perspective and helped the PRIA team to understand the nature of changes that have taken place in the settlements. This approach was used with community members to get an overview of key events in chronological order. The process of **Participatory Social and Resource Mapping** allowed the team to work with community members to generate a social and resource map to gather information on the spatial layout, location of houses, and infrastructure facilities. This process also mapped landmarks, roads, intersecting railway tracks, as well as local social infrastructure such as schools, health centres, mosques and temples. Public areas, such as parks, and service points like hand pumps and ration shops, were also identified. The core SIC members, along with other community members, enumerators, and the PRIA team conducted a **Stakeholder Analysis** to identify the key people in the community. This process charted the individuals and institutions that could be engaged in community building processes.

Undertaking Participatory Settlement Enumeration (PSE): PRIA adopted a number of innovations in PSE, choosing to use mobile smartphone based technology for enumeration. Young girls and boys from the community who were SIC members and students from the local university and colleges were trained in mobile-based PSE. This gave them enormous confidence – they now had a new skill, their settlement was visible, and their community had a voice. These youths are now on their way to becoming champion citizen leaders, active in their communities.

Participatory Settlement Enumeration (PSE), unlike traditional enumeration or surveying, is designed, conducted and managed by the communities living in the informal settlements of a city. Traditional enumeration conducted solely by ‘outsiders’— whether government personnel or agencies appointed by the government—often appropriates data or information from the community and use it for planning at the city, state or national level. PSE, on the other hand, is managed by ‘insiders’ in the community, sometimes facilitated by ‘outsiders’, leading to ownership of data, its analysis and community-led planning at the local level. Participation and inclusion in PSE thus becomes an empowering experience for the hitherto unaccounted and voiceless urban poor. As an alternative public policy tool it ensures that nobody remains unaccounted or ‘left behind’. The origin of the PSE method is rooted in the tradition of participatory research. PSE as a methodology is developed in the belief that people’s experience and knowledge are indispensable for informing and guiding development policies.

House listing: PSE included all the households in a particular settlement. It required a clear demarcation and house numbering or house listing process for each settlement. It was essential for this activity to be a participatory process to ensure that every household was

systematically assigned a number. The team, comprising the SIC members and community enumerators, were trained by PRIA in the house numbering process.

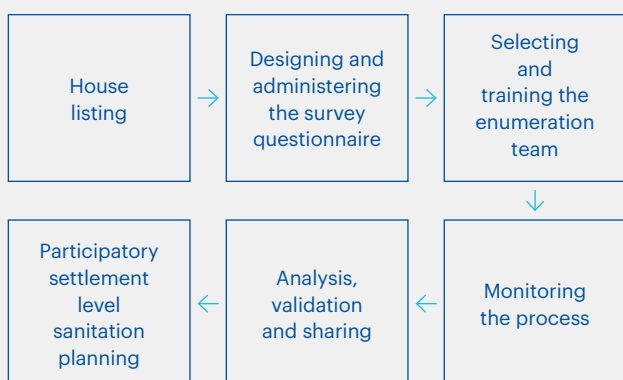
Designing and administering the survey questionnaire:

The informal interactions with the community members while mapping the settlements and conducting PUAs in various settlements provided a solid understanding of the information required to prepare a settlement level participatory sanitation plan. The administered questionnaire was divided into sections for ease of data filling and analysis. While the thrust of the questionnaire was to gauge the level of sanitation facilities in the informal settlements (availability of toilets, water, waste management, sewage and drainage system), it also captured basic information about households, which was often important for correlation analysis. The questionnaire was designed in consultation with the community members, city authorities and other key stakeholders, and used mobile-based enumeration.

Selecting and training the enumeration team: A loosely structured one-day orientation session was organised for 15-20 community enumerators who were selected from among the youths residing in various informal settlements and students from local universities and colleges. The community youth were identified during the PUA processes and often played a crucial role in SIC formation. All settlements covered by enumeration in the city were divided between these 15-20 members. Their presence made communities feel more comfortable.

The training session introduced the participants to the questionnaire, followed by an intensive discussion of the rationale and logical flow of various questions. Once an understanding of the questionnaire had been developed, the participants were taken through the customised mobile application designed to capture the enumerations. Following this, the key areas of monitoring and verification of the enumeration were discussed. Additionally, an understanding of smartphone-based enumeration was also discussed, focussing on basic aspects like the use of GPS, power management, data connections, etc.

These trained enumerators and the PRIA team hosted a half-day orientation session for some SIC members who were keen to work together with the enumerators in their own settlements. Many enumerators and SIC members had never used a smartphone before, and an additional step was thus to demystify technology.



Monitoring the enumeration process: Monitoring of PSE was an essential part of ensuring data quality. One of the advantages of a mobile-based application lies in the fact that a large number of monitoring aspects can be built right into the application. It is to be noted that the enumeration was created with built-in skip logic, which means that subsequent questions were based on previous answers and the selection of certain variables. Additionally, to avoid common mistakes, the application was built to reject and warn against certain errors. Apart from such back-end precautions, a strict system of horizontal and vertical division of responsibility with checks and balances was set up. Once a settlement had been enumerated, a Survey Coordinator (from the PRIA team) verified the data for consistency using a checklist. The Survey Administrator (from the PRIA team) conducted random evaluations as well.

Analysis, validation and sharing: The entire enumeration process came full circle through the analysis, validation and sharing of the data generated. The analysis consisted of the tabulation of settlement-wise breakdowns of the demographics of all respondents and their households. Basic household information, including cross-tabulation between the houses with ration cards and by income, as well as ownership and registration of houses, were analysed. A few cases included the cross-tabulation of member level details such as gender, age, education and occupation with access to legal documents. The analysis also exhibited the state of access to sanitation facilities, such as toilets, and the dominant kind of structural set-up in the settlements.

Keeping in mind the dynamic nature of informal settlements, these analyses were then validated at multiple rounds of group meetings with the community members. Information was changed and modified as per changes on the ground. This process kept the community engaged and participative in ensuring that the data reflected the current status of their settlements. Once validated, the data was shared with the other stakeholders, including elected councillors and municipal officers. The community and other stakeholders discussed the results of the enumeration with an eye to potential solutions and positive changes.

Participatory settlement level sanitation planning: The data generated by PSE helped the SIC members to identify households without toilets and willing to construct one through subsidies available under SBM-U. In order

to become eligible for such a subsidy, each household needs to possess an Adhaar Card (Unique Identification Document – UID) and a functional bank account where the beneficiary can receive the money. The PSE also provided data about households that did not possess these documents. A plan of action was prepared by the SIC Core members to organise camps to which the appropriate authorities were invited and where these documents were provided to those households. Following this, the SICs with support from the PRIA team submitted online applications for domestic toilets. The PSE also identified those households which did not have space to construct them. A settlement level plan was prepared for the construction of community toilets, which was submitted to the city authorities. In addition, the settlement level sanitation plan included a proposal for waste management and suggestions for a drainage system in the settlement.

The SIC core team took it upon themselves to monitor the implementation of settlement level sanitation plans. The progress or lack of it was reported to the appropriate city officials for further action. These officials were invited to the settlements from time to time for inspection and dialogue with community members.

Case Study 2

Experiences of three cities as urban design studios: Jaipur, Pushkar, Ajmer

Introduction

In India, market places are more than a space for trade and business. They have gone through several transformations for centuries, and are primarily multiuser and multi-activity spaces for numerous social and cultural purposes. They are dynamic and ever-changing in nature, accommodating all of their users and activities. Traditional Indian markets are more informal and organic with flexible boundaries, rather than being pre-designed organized clusters. These spaces underwent incremental growth over a long period of time, adapting to their own context. In spite of globalization, they have managed to retain their inherent characteristics. Students and faculty of the Department of Planning & Architecture at Manipal University, Jaipur conducted urban design studios in three cities in Rajasthan.

Jaipur, Capital City

Jaipur was the first planned city in India. The city was planned according to Vastu Shastra (ancient science) by Indian architect Vidyadhar Bhattacharya in 1727. It is unique among pre-modern Indian cities for its spatial planning. Unlike other cities from the same period, it is still able to handle the heavy motor traffic of the present time and its markets are vibrant and very popular with visitors coming from around the globe.

However, challenges are emerging in the old city centre, and over time the efficacy of the existing urban infrastructure has decreased. Due to the high density of its population, it is struggling to deal with the ever-growing amount of traffic, the demand for parking spaces and waste management.

The design problem focused on the evolution of walled city of Jaipur, and especially the market places, emphasizing contemporary issues and strategies for influencing urban policy. We examined the city from multi-disciplinary perspectives, including history, sociology, geography, anthropology, economics and political science, as a basis for understanding contemporary urban problems and the role of urban design in the creation of solutions for these problems.

Challenges

We sought to adopt an immersive learning process, whereby students learn by doing things themselves. They went to the site, spent time with various stakeholders and tried to understand the challenges, explore possible solutions and reach a common consensus. As a team, we faced two main challenges.

- Involvement of local stakeholders. The students had to be trained in various onsite engagement techniques, and the extraction of the necessary information was also something that evolved with time. However, our students managed to pick up the skills quickly, and were able to interact well with stakeholders in various places in the study area.
- The other challenge was data inconsistency. Data available from various departments and organizations on the study area took a long time to adapt to the common format. Many datasets and maps were out of date, and had to be revalidated under modern conditions.

Interventions suggested for the studio.

The studio outcomes were broadly based on the following lines:

- Utilization of available public open spaces in the area.
- Signage system to guide visitors and make the area more navigable.
- Upgrading the existing service infrastructure of market places.
- Creation of better business opportunities by means of 'time bound space allocation'.
- Creation of engaging walking/pedestrian experiences for visitors to the market.

Several projects have been implemented by the government in recent years in this area. But many of these found it hard to yield the desired results, as in many cases the stakeholders were seldom included. As a result, the users of these spaces failed to make much sense of things, as such projects often failed to cater to their needs. Hence an extensive stakeholder engagement process must be in place as a feedback loop to augment the functioning of the urban system in the old city centre.

Pushkar Town

Urban Revitalization of the town of Pushkar- exploration focusing on how to revitalize its streets and Ghats, transforming them from a chaotic site into a thriving planned community that reinforces and enhances existing residential, commercial and mixed-use areas, making for a vital and sustainable community. Importance is given to the role of open space as a community asset in terms of providing places to gather and as critical components for restoring environmental systems in and around the site.

These projects will explore the design issues and approaches of urban planning, street design, public transit and issues of residential, commercial and mixed-use.

Challenges

- To develop an overall design approach for a very different scenario at the same place at the same time, i.e. international and national tourism and pilgrimage without compromising the needs of local residents.

- Many people refuse to respond to the primary survey as they are afraid of losing their business spaces.
- Brownfield projects and mixed use development are highly challenging in themselves.
- Integration of old/heritage structure with newly developed buildings.

Interventions and key observations

The students offered solutions based on their investigation into the realm of public spaces of major religious importance, and which dealt with various aspects of challenges in this area. The significant shortcoming identified through this exercise is the lack of community participation in the development process. Most of the projects implemented in the area have failed to deliver any conclusive outcome. Hence a community engagement process is necessary to access and monitor the impact of any intervention in the area in a more holistic way.

Ajmer Town

Ajmer is one of the oldest cities in India. Its historical, religious and cultural significance, and its ecosystem, are what give it such a unique character. The town curls organically around a lake, which adds an important dimension to the city. Ajmer enjoys a unique geography surrounded by the beautiful hills of Aravalli and their pristine landscape. Located in the heart of the city, the scenic Anasagar Lake is a great spot for attracting visitors and biodiversity. Various tourist attractions and monuments of historic importance, such as Akbar Fort, Adhai Din ka Zhopra, Taragarh Fort, Sonaji ki Nasiyan, cater to tourism in the city. Ajmer has good connectivity with the surrounding settlements and major cities in India, through highways and rail links across the area. Within the city, the use of battery driven rickshaws (E-rickshaws) and non-motorized vehicles (tongas) renders sustainability to the region. Apart from the tourism-based economy, the railway has enabled the city to emerge as a trade centre for manufactured goods including wool textiles, marble, hosiery, shoes, soap, and pharmaceuticals.

The Context

Ajmer is one of the eight mission cities selected by the GOI Heritage City Development and Augmentation Yojana (HRIDAY) scheme. Other ongoing schemes in the city such as AMRUT, PRASAD, Housing for all, Swachh Bharat Mission, National Urban Livelihood

Mission etc. are likely to improve the existing infrastructure. However, the pilgrimage area needs critical intervention in order to improve the safety and hygiene of a space of such major religious importance. Due to organic development, a large part of the settlement is unorganized and informal, and there is encroachment on public spaces. Moreover, centuries of rule by various regimes have left their mark on the settlement. In the present context, the urban space has become a magnet for disciples and tourists despite the presence of critical chock points. Thus, an understanding of the complexity of the urban dynamics in this area from the stakeholder's perspective may shed new light on the existing challenges.

- The students are taught to manage design projects to deal with highly complex challenges at an urban level in relation to different kinds of public spaces in the Kesarganj area of Ajmer city. The students worked efficiently within multi-disciplinary environments and suggested effective solutions in accordance with the local authorities' developmental standards. The design solutions are formulated to provide a better public environment to a mixed type of user as in case of Kesarganj.
- In accordance with the present scenario in Kesarganj, and by comparing different layers of the urban setting, the design strategies proposed are related to improvisation of movement/linkages by creating coherence and order in the form of clusters to define spaces by type, developing the image of the area to make it more legible, without losing any of its identity.

Challenges

- Many people refused to respond to the primary survey as they are afraid of losing their space for business. Much of the feedback was obtained from different approaches, so it was difficult to streamline everything and convert intangible parameters into tangible parameters.
- Dealing with undefined isolated open spaces. The development of mixed-use designs is a challenge in itself.
- Integration of old/heritage structure with newly developed buildings.
- Limited scope for development of public open spaces such as parks, etc.

Interventions and key observations

The students offered solutions based on their investigation into the realm of public spaces of major religious importance. These solutions dealt with various aspects of challenges in this area. The most significant shortcoming to be revealed by this exercise is the lack of public participation in the development process. Most of the projects implemented in the area have failed to deliver any conclusive outcome. Hence a public engagement process is necessary to access and monitor the impact of any intervention in the area in a more holistic way.

4. Dignified Work in Poor Communities

Francesca Antongiovanni, Stefano Chessa, Mariantonietta Cocco, Marta Congiu, Romina Deriu, Valentina Ghibellini, Alberto Merler, Andrea Vargiu

Introduction

Sardinia, Italy, is one of the European regions with the highest unemployment rate. According to the latest data from Eurostat, in 2017 the percentage of people between 15 and 74 years of age who were out of work in Sardinia was 17%. The European Union (28 countries) mean was 7.6%. In Italy, it was 11.2%. More than half of the unemployment in Sardinia (53.4%) can be defined as long-term. Figures for youth unemployment rates are even more dramatic: 46.8% of 15 to 24 years old did not have a job in 2017. The figure had been 56.3% just one year earlier, in 2016. The figure for Europe (European Union – 28 countries) in 2017 was 16.8%.⁽¹⁴⁾

Those figures, of course, do not account for the quality of working conditions. And they only partially account for a situation which in some areas is certainly more acute than in others, such as in areas with high rates of material deprivation and social exclusion. Our work specifically refers to one of those areas.

Santa Maria di Pisa is a highly disadvantaged neighbourhood of Sassari, a city of about 127,000 inhabitants in the northern part of Sardinia. The neighbourhood was raised between 1973 and 1979 by means of a political initiative of city planning and urbanization directed towards public housing. Until then, many families in Sassari lived in unhealthy sanitary conditions. Most of them had illegally occupied small disused military barracks dating from the Second World War that were located on the town's outskirts, or lived in decaying and crumbling houses in the old historic centre. The local municipal authorities undertook a major urbanization plan to provide decent housing solutions and higher urban standards to those people.

The largest part of the neighbourhood is nowadays characterized by a large number of public lodgings; of 1,155 dwellings there are only about 60 that are private houses. The latter were built by cooperatives of ex-workers when the rest of the neighbourhood was already in place and it was already clear that the high density of public housing had produced a ghetto. This belated measure did not substantially affect the overall situation of the neighbourhood, which is nowadays rather degraded and unsafe. No official statistics exist, but our direct observation shows that living standards are low, with high unemployment rates and low schooling.

Approach and first steps

Our first structured action-research approach to the area dates back to 2012. Ever since, we have been running many different activities with the people of Santa Maria di Pisa, all aimed at producing social change through a process of citizen empowerment and knowledge building.⁽¹⁵⁾

The Foist Laboratory for Social Policies and Education Processes was founded in 1977 at the University of Sassari by sociology professor Alberto Merler as a place for students, researchers, practitioners and citizens to meet, study and act together for positive social change. In 2012, Foist Lab engaged in a programme called "Equity and Sustainability Field Hearings"⁽¹⁶⁾: a worldwide initiative promoted by IFE – Initiative for Equality.⁽¹⁷⁾

14. All data was retrieved from the Eurostat website on February 3rd 2019. <https://ec.europa.eu/eurostat>. All data refers to regional statistics in the NUTS2 classification: the classification of territorial units for statistics. According to that classification, EU member states are subdivided at three different levels, each covering NUTS 1, 2 and 3, from larger to smaller areas.

15. See: A. K. Sen (1992). *Inequality Reexamined*. Oxford: Oxford University Press; Nussbaum, M. (2000). *Women and human development: the capabilities approach*, Cambridge New York: Cambridge University Press.

16. Equity and Sustainability Field Hearings is a global project proposed by Initiative for Equality aimed at getting the disempowered heard on a global level. It is based on "a democratically governed network of local Field Hearings partners in more than 80 countries." See <https://initiativeforequality.org/what-we-do/citizen-monitoring/history-organization-of-field-hearings/> (accessed Feb. 3rd 2019).

Activities run by the Foist Lab have been based on a guiding principle that action, research, education and training must go hand in hand.⁽¹⁸⁾ Therefore, our initiative involved a wide variety of people, ranging from PhD students in Social Sciences and Social Work, students on the MA in Social Work and Social Policies, and researchers and collaborators from the Foist Laboratory. As the work progressed, other people, such as social workers, became involved in the process. Today, other practitioners, organizations and community members are called upon to actively engage in the process.

In the initial phases of our work, students were mainly involved in gathering structural and historical information about the area. They also held interviews and administered questionnaires, and then organized the data and produced some basic analyses. This first wave of activities gave us the general information so we could go to the field with the more solid knowledge required to set up an action research programme. Further data was then collected through questionnaires, local visits, observations and interviews.

Following up on these first waves of data connection, it became rapidly clear that exclusion and ghettoization were deeply interiorized by community members and that this was strongly connected to the way they perceived themselves and potential ways to produce change. The very process through which the neighbourhood formed actually generated high vulnerability among the people, coupled with a strong culture of welfarism that is passed on from one generation to the next. This is the situation that was so often depicted by interviewees, who describe a deep-rooted incapacity of the people to step out of the multiple aid mechanisms

17. Initiative For Equality is a global network of individual activists and organizations working towards a more equitable world. As stated in the organization's mission: "We facilitate the empowerment and participation of people who have been socially, economically or politically marginalized. We promote more equitable political and economic systems, and coordinate citizen monitoring of governments and corporations. We help civil society groups around the world share information, develop political strategies, and take collective action towards more equitable and sustainable development." <https://initiativeforequality.org/about-us/vision-mission/> (accessed Feb. 3rd, 2019).

18. For a more comprehensive description of the approach adopted at the Foist Laboratory, see Chessa, S., Cocco, M., Sharp, K. and Vargiu, A. The FOIST Laboratory: University Student Engagement and Community Empowerment through Higher Education, Sardinia, Italy, in Tandon, R., Hall, B., Lepore, W. and Singh, W. Knowledge and Engagement. Building Capacity for the Next Generation of Community Based Researchers. New Delhi: PRIA. pp. 220-229.

set up by the State: a vicious circle in which unemployment is both the cause and effect of a chronic dependence on public aid. As one social worker said: "There are 'historical' family units that we have constantly taken care of for years and years". The words of the President of a volunteer organization underline the concept: "A welfarist culture has been fully developed; the idea that the city administration must give you everything, the church must give you everything... and this is the problem".

The co-construction of knowledge for shared local solutions: the synergy between research, community and social work

Indeed, for community members as well as for welfare practitioners and volunteers engaged in the neighbourhood, the vicious circle of welfarism is hard to break. As we investigated the context, this blind alley became more and more clear. Furthermore, the overall state of actions and interventions aimed at producing social change looked fragmented and uncoordinated. Public social programmes mainly seemed to have been conceived in such a way that people would have to adapt to them, rather than the other way round. As a matter of fact, we came to observe a disconnection between public policies and people's real lives. Research clearly showed that practitioners were somehow caught in between the acutely pressing needs as explicitly expressed by citizens and their institutions' organizational imperatives that basically kept them in their offices and away from the real lives of people. Hence, evidence we were collecting in Santa Maria di Pisa from interviews, questionnaires and observation was strongly consistent with the research literature about the damages of welfarism and the dramatic consequences of new public management for the working conditions of social workers and the intimate contradiction between professional and institutional mandates.⁽¹⁹⁾

19. See: de Gaulejac, V. (2005). *La société malade de la gestion. Idéologie gestionnaire, pouvoir managérial et harcèlement social*. Paris: Seuil.

20. Among others, see Clarke, J. and Newman, J. (1992). *Managing to survive: dilemmas of changing organisational forms in the public sector*. Paper presented at the Social Policy Association Conference, University of Nottingham, July 1992.

The case study before our eyes was interesting insofar as, whereas the literature generally observes a shift from welfarism to new public management, in Santa Maria di Pisa both are observably acting at the same time.⁽²⁰⁾ On the citizens' side, we witnessed what Sennet calls "the shame of dependence".⁽²¹⁾ Hence, the need for a stronger articulation of action with research by working both with social workers and the most disadvantaged citizens.

The shift towards more collaborative research started with a Science Shop project⁽²²⁾ by an MA student of Social Work and Social Policies who was pursuing a better understanding of the link between organizational stances and the working conditions of social workers engaging with disadvantaged citizens in Santa Maria di Pisa. An action research programme quickly took form, which gradually also engaged early stage and experienced researchers from the Foist Laboratory in a series of meetings with a group of citizens who were receiving aid from public social programmes. A wider initiative was set up and funding was obtained through IntHum, a social promotion association that was set up in 2011 in partnership between researchers from the Foist Laboratory and members of four civil society organizations in order to foster sustainable and continuous relationships between universities and civil society.⁽²³⁾

In 2016, the Social Cohesion and Equal Opportunities and Social Services Sector of the Municipality of Sassari invited local residents to voluntarily participate in a series of group meetings organized jointly with IntHum and Foist Lab and involving citizens, social workers, practitioners, researchers and students. These meetings were rapidly associated with the community walks run by local people, and which led to community mapping.

Within a short time, it became clear that the diffuse attitudes to the analysis of issues and the search for solutions needed to be subverted if we were to make any changes. This is common practice for Community

Based Research. Citizens were thus involved as primary experts on their communities, which implied a certain time to negotiate and develop a shared understanding of the new dynamics that this would imply. Furthermore, an asset-based approach was used to shift the group's attention from its patent difficulties and needs to less noticed positive factors. Through community mapping, the participants were called upon to identify relevant resources in the neighbourhood, by referring to places, policies, events and people. This eventually led to the identification of new people who could take part in the group's activities and who were promptly invited to do so. Further participants were then co-opted while others attended less regularly, and the composition of the group became more diversified.

Within more or less one year the group had become relatively stable, motivated and relatively well amalgamated notwithstanding objective differences among the participants. However, the development of a certain tendency to work collectively turned diversity into a resource rather than a shortcoming, albeit always in precarious balance, which the group facilitators always had to keep a watch over. So, the group developed a somewhat well-defined understanding of the overall situation in the neighbourhood. Some other initiatives came to highlight the common enterprise of knowledge-building, such as, for instance, work done by children from the local elementary school who, by initiative of their teacher and with the help of some members of the group, engaged in producing further knowledge and understanding by means of filmed interviews with community members and picture-taking. The outcomes of those activities were eventually shared with the wider community and municipality at open events.

Shared knowledge and understanding was then used to produce a shared vision for future community development. The group thus engaged in scenario building activities. In order to do so, a largely adapted version of the Scenario Workshop technique was used to generate desirable future scenarios within a medium and long-term timeframe.⁽²⁴⁾

Through Scenario Workshop, an action plan was designed based on five pillars, each intimately connected

21. Sennet, R. (2003). *Respect in a World of Inequality*. New York: Norton & Co.

22. On Science Shops and how they work, see the Living Knowledge website, notably <https://www.livingknowledge.org/science-shops/about-science-shops/> (accessed February 3rd 2019).

23. IntHum was one of the outputs of PERARES – Public Engagement with Research and Research Engagement with Society: a project funded by the European Commission under the 7th Framework Programme (grant agreement n° SiS-CT-2010-244264). For more information: <https://www.livingknowledge.org/projects/perares/> (accessed February 3rd 2019).

24. Scenario Workshop is the generally used short name for EASW – European Awareness Scenario Workshop. EASW was developed by DGXIII -D "Innovation" programme which originally was used to identify future scenarios for sustainable urban living through direct involvement of different groups of stakeholders.

with the others and respectively addressing: 1) wellness and health; 2) more and dignified job opportunities; 3) education and training for all; 4) community identity and social cohesion; 5) renewed relationships between citizens and local authorities. Each pillar implies a range of possible actions, and some of them have already been identified by the group while nonetheless leaving options open. In fact, the plan has been conceived as an open call to action within a rather well-defined operational framework. Some time after its original release, we came to name this initiative “PISA”: Participant platform for Innovation, Social inclusion and Active citizenship. An open programmatic document was issued that calls on all stakeholders – be they single citizens or collective entities like the municipality, schools or civil society organizations – to join together and work within a shared vision for the common good. The general idea is that this “platform” – as we called it – will encourage continued actions over time by bringing initiatives and actors that have up to now been highly disconnected under the same umbrella. This way, it can be imagined that structural links between actions aimed at generating more and dignified job opportunities, for instance, can be conceived and set up. But also, such actions are conceived in strong relationship with training and the certification of informal skills, which are activities to be developed within pillar number 3. Furthermore, we know that job opportunities are actually strongly connected with the diffuse perception and negative representation of the neighbourhood and its inhabitants (pillar 4) as well as to health (pillar 1) and the general organization of public provisions by local authorities (pillar 5).

If those connections exist and have an impact upon people’s lives – and we know they do, because we collectively came to such an understanding through structured community-based research and knowledge generation – why should actions to address them be disconnected? The organization of concepts as separate entities that we use to organize our perception of experience should not prevent us from acknowledging the multiple relations that exist in a reality that our limited intelligence is only able to grasp by means of very rough simplification. Similarly, our limited rational capacities imply that we organize our action as if the real world were as we picture it. However, this does not automatically imply that we harness engagement within such limited mental schemes and action frames.

Life trajectories and skills of people from poor communities

One of the most common observations that emerged as we worked our way through a common understanding of community issues in Santa Maria di Pisa was the quite obvious connection between low levels of employment and low schooling, high rates of school dropout and a generalized lack of formal professional certification. This latter aspect contrasted with the widespread skills and competences among the people we came into contact with, and which are connected with a general ability and creativity for detecting, using and combining very diverse resources. This is no news to anyone who is used to dealing with marginality and poverty: just like anyone, people in need are constantly pressured into finding creative methods to work their way through what are often very difficult and harsh environments.⁽²⁵⁾

In *L’invention du quotidien*, Michel de Certeau makes the following distinction between strategy and tactics:

“I call ‘strategy’ the calculation of power relationships which are possible when a subject of will and power can be isolated from an “environment”. It postulates a place likely to be circumscribed as one’s own, thus serving as a basis for managing its relations with a distinct exteriority. Political, economic or scientific rationality is based on this strategic model. On the contrary, I call ‘tactics’ a calculation which cannot count on a proper, and therefore nor on a frontier which distinguishes the other as a visible whole. Tactics have no other place than that of the other. [...] It does not have a base to capitalize its advantages, prepare its expansions and ensure independence in the circumstances. The “own” is a victory of the place over time. On the contrary, because of its non-place, tactics depends on time, vigilant to “seizing on” opportunities for profit as they come by. Whatever it earns, it does not keep. It must constantly play with events to make them ‘opportunities’⁽²⁶⁾”. Later in the book, he adds: “Tactics has no place than the

25. Vargiu, A. (2009). *Negoziare la marginalità attraverso i consumi di beni e servizi*, in Bovone, L. (a cura di). *Consumi ai margini*. Roma: Donzelli. pp. 56-83.

26. de Certeau, M. (1990). *L’invention du quotidien*. 1. arts de faire. Paris: Gallimard, p. 46.

others. Hence, it must play within a ground imposed on it as organized by the law of a foreign force. [...] It does not have the possibility to give itself a global project nor to totalize the adversary in a distinct, visible and objectivable space. It advances step by step. It takes advantage of “opportunities” and depends on them, without a base where profits can be stored, to increase one’s own and to plan outings. What it earns is not to stay. This non-place undoubtedly allows mobility, but within docility to the vagaries of time, to seize opportunities as they come by. It must use, vigilant, the faults that the peculiar conjunctures open in the surveillance of the proprietary power. She poaches there. She creates surprises. It is possible for it to be where it is not expected. It is cunning”.⁽²⁷⁾

Tactics, we observed, are daily business for people living in Santa Maria di Pisa. As de Certeau points out, time is the specific dimension of tactics. Thus trajectories are the observable outcome of tactics that develop out of a day-by-day combination of what is at hand *hic et nunc*: here and now.

For instance, regarding job opportunities and working conditions, evidence shows that oftentimes the skills and/or knowledge acquired in informal settings are not sufficiently valued within the job market. Furthermore formal qualifications are often required to access professional training. A vicious circle is thus in place concerning initial training and education, job opportunities and further professional training. No formal certification of professional skills implies no formalized contractual status, since this is connected to an identifiable set of competences and related duties and responsibilities. Unformalized working conditions imply lower remuneration, as well as low or null protection and guarantees, hence the need to act tactically to scrape together a composite income, i.e. to derive revenues from different supply channels, which are often public and private.⁽²⁸⁾ In fact, since informal work does not produce formal income, certification of low income levels can be used to gain access to different kinds of public support measures. Hence, persisting states of dependency on State aid.

27. Ivi, pp. 60-61.

28. See: Merler, A. (1984). *Il quotidiano dipendente. Lavoro, famiglia e servizi in Sardegna*. Sassari: Iniziative culturali; Merler, A. (1988). *Politiche sociali e sviluppo composito*. Sassari: Iniziative culturali; Siza, R. (2007). *Le povertà provvisorie*, in Chessa, S. and Piga, M.L. (a cura di) *Processi culturali per le politiche sociali integrate Sardegna e confronti*. Sassari: Edes.

In the past, the sources to draw on for composite income were minor. However, the precariousness and fragmentation of public support measures today are exposing many people to a greater risk of poverty and social exclusion. This is closely related to their unstable life trajectories that result in low levels of formal education, high risks of school dropout and early entry into adulthood.

As for the social fabric, people’s life paths are characterized by the absence of future aspirations, and improvised life trajectories due to the reiteration of poverty handed down from generation to generation. This became patently clear when we involved people in an activity designed to capture and share their professional and family trajectories. In this workshop, people were asked to pin up small sheets with clothes pegs (as if they were hanging out clothes to dry) with information on “work and training” (green leaflet) and “family” (pink leaflet). This simple thought-provoking activity encouraged people to view their professional and training lives from a different perspective and to become aware of what is often a wide range of both formal and informal skills and abilities that they had acquired throughout various experiences.

This activity made it possible to develop conversations and display life paths using very simple techniques. It made the evidence immediately visible and, for instance, showed the significant connections between landmark moments in people’s lives and the very material conditions under which these are formed. It was thus possible to directly observe and comment on how early entry into adulthood can depend upon various factors which are, in turn, connected with education and training.

Some of these conversations caused some unforeseen evidence to emerge, and which shows a connection between the somewhat matriarchal structure of some families and highly adaptive and resilient capacities.

Self-employment and social entrepreneurship

Those activities were coupled with another one aimed at stimulating considerations of and appreciation of the participants’ competences. People were asked to react to such questions as “What do I do?”, “What should I do?”, and “What am I able to do?” Their answers were written down and collected anonymously, and helped

to kick-start a conversation on hidden competences, aspirations and required qualifications, whether certified or not. Through discussion, the participants came to develop a different understanding of their potential by connecting appraisals of their real abilities with the kind of aspirations that go frequently unconfessed in more formal contexts.

The appreciation of existing skills and competences, re-appropriation of self-esteem, channelling of tactical abilities into a coherent idea of possible life paths, along with promotion of social cohesion by strengthening of community ties are some of the key areas of this long-term community-based programme involving various activities and actions. This was also the basis for an ongoing initiative which, in 2017, led to the creation of a tailoring workshop by a group of mothers of children attending the local primary school. In doing so, they were supported by a teacher who is a very active member of our engaged citizens group and who arranged for the workshop to be held at the school and for an artist to work with mothers to teach them the Munari method that encourages the material expression of creativity.

The initiative generated a sense of solidarity and cohesion among the group of mothers and the community. The laboratory has become a point of reference for other parents of primary schoolchildren, as well as a place where manual skills and creativity have been shaped and realised. A group called “Le Sfacciate” (The Bearface) was quite successful in selling their first lots of bags decorated with stylized faces to raise funds for the school.²⁹ Hence, the idea to push this experience a bit further by teaching further competences in tailoring skills and trying to sell their products to a wider public.

Thus, through the IntHum association a project was collectively devised to obtain funding to provide for training and connections with a wider network of cooperatives and social enterprises. The role of social enterprises is also foreseen as a supporting one for an otherwise fragile business entity. Notably, this support is planned so as not to overburden members of the working group with administrative and management responsibilities that they do not want. Furthermore, the structural connection with a solidarity economy has clear symbolic value that is strongly connected to the underlying philosophy of the PISA platform.

29. “Sfacciate” is a play on the words “faccia” (face) and “sfacciata” (bearfaced).

The laboratory is a creative, educational and informative space based on an inclusive approach. The aim is to promote and activate even higher personal and professional skills and abilities, investing in human capital. The laboratory has become the symbolic space for the promotion of female and family enterprise and self-determination, with relevant implications at a personal as well as a community level. At the same time, it has created an integrated system of territorial networks made up of people, organizations and associations that support and promote a methodology involving innovative design activities. This is consistent with the idea that craftsmanship can be a form of sociable expertise that reconnects people with their communities, and hence means that a more dignified life is possible.³⁰

Conclusion

All higher education institutions, whether publicly or privately funded, have a responsibility to contribute to the public good. Some of our public universities, such as Simon Fraser University in Canada and Gulu University in Uganda, have defined themselves as ‘engaged’ universities. By this they mean that nearly all of their students, academic staff and administrative staff are engaged with the community, the place where they are located. Other privately funded universities such as Manipal University in India and Stanford University in the USA view contribution to their communities as one of the keys to their identity. But all universities have the capacity to shape their mission statements and strategic plans in ways that offer benefits to both their students in terms of enhanced skills and employment possibilities and to their societies, the sources of both the business profits that pay their fees and the public taxation that supports them. The existence of the United Nations Sustainable Development Goals is an opportunity for all HEIs to provide a focus for an important stream of collective outputs. Engaged teaching, research and partnerships can all benefit from alignment with the SDGs. They are universal for all nations, and are interconnected in that, for instance, issues of gender justice can relate to availability of water and sanitation. The SDGs are also intended to be transformative, meaning that they are meant to transform negative power imbalances and facilitate positive social, economic and environmen-

30. Sennet, R. (2008). *The Craftsman*. New Haven and London: Yale University Press.

tal change. We can think of the SDGs as providing the rationale behind the current thinking in various political circles that is sometimes called the ‘green new deal’, the linking of economic and social justice with a shift from dependency on fossil fuels.

Our various case studies illustrate the three characteristics of the SDGs: their universality, their transdisciplinarity and their transformative nature. In the urban planning case study from India, we see two approaches to a combination of SDGs. The PRIA example illustrates how young people can be empowered to play active roles in mapping and enumerating their communities using handheld GPS tools to provide data that local governments never had. Sanitation engineers, university trained CSO workers, young people, local government officers, and the inhabitants of the urban slums have worked together in three cities in India to make changes to the water supply and public sanitation services. In the other Indian case study, we see how the university has created an opportunity for public markets and the variety of women and men working in them, whereby they became the ‘teachers’ of the students who were sent out to work using a design studio model. In this latter case, it may not be clear how much the students contributed to the community, but what they learned extended far beyond what they would have learned from theoretical texts.

Maths is the M of STEM. It is noted in the South African case study that maths are usually difficult to learn and for students who had not done well at school before, maths was seen as very frightening indeed. But the Durban University of Technology, working with the Jirah Academy, discovered a new approach to teaching the subject, as part of the engineering bridging programme, and which proved to be a huge success with large numbers of second chance learners, young women and men who were labelled as NEET (Not Educated, Employed or in Training). The element that made the difference in the substantial achievements of these young people was what they called a ‘humanistic’ approach and specifically an approach based on the philosophy of Ubuntu (I am because you are). Students were not pitted against each other in a competitive environment, they were expected to work together to ensure that each member of the class understood all the concepts. They worked together at school and out of school and were so successful that many were able to make the transition to technical and vocational education and training, and even to university itself. The SDGs of both education and employment were thereby

addressed and young people became active citizens able to act in support of their own dreams.

The University of Sassari has since the late 1970s been working with a hybrid institutional structure that has allowed university students, community members from Santa Maria de Pisa, other social institutions and municipal workers to come together to build their community, to enhance job possibilities and support the emergence of community leadership and visions. This is an excellent example of the transdisciplinary focus of the SDGs. Their work combines attention to wellness and health, the search for dignified work, education and training, community identity and improved relationships with local authorities. Over the years of this work in Santa Maria de Pisa, both university professors and students have learned much from the community, and the local authorities have been able to interact with it through the institutional structure called FOIST in ways that decrease power imbalances. In time, the community has gradually gained confidence in its own capacity to take action with regard to their lives.

Tremblay and Wiebe, in their stories on water, tell us that “whether we look at the lack of potable water in indigenous communities across Canada or how women confront barriers to clean water in South Africa, it becomes clear that water stories expose asymmetrical relations of power, and the persistence of colonization and environmental injustice in our current time”. The same can be said about all of the issues covered by the UN SDGs. None of them exist in isolation from the complexities of politics, inequality and oppression. All of them are interconnected. But as our case studies have shown, universities and higher education institutions are already taking action on these issues and have the potential to play a much larger role in the achievement of the SDGs. Each of us who works inside, alongside or outside these institutions has a role to play. No action is too small to count. All of us together can achieve the changes that we hunger for.

Conclusions

1. Each SDG has been defined in terms of issues faced by humanity at this time. Water, education, habitat and work are 'transdisciplinary' constructs. Hence, STEM can provide a technical understanding of these issues but not holistic socio-cultural knowledge of that specific context.
 2. Teaching at HEIs continues to be discipline bound. SDGs can only be taught in a trans-disciplinary manner, overcoming rigid silos of academic disciplines.
 3. Learning about SDGs, even for students at HEIs, has to be linked with the real world. Learning by doing, by engaging with the real world is critical for teaching about the SDGs.
 4. Teachers at HEIs need to acquire competencies and confidence in new pedagogies of engaged teaching. Special opportunities for strengthening the capacities of teachers need to be created.
 5. Integration of SDGs in the research functions of HEIs is most widely and urgently needed. Each SDG, in each context, for each type of community, requires new, actionable knowledge for appropriate local solutions.
 6. Such an approach to research focused on the SDGs would thereby necessitate trans-disciplinary and inter-disciplinary interactions with the theories and frameworks of STEM as well as the Humanities and Social Sciences.
 7. No single SDG, nor its sub-goals, can be addressed independently.
 8. As the SDGs were being formulated, and knowledge about climate change and ecological destruction was becoming universally available over the last 5-10 years, it has become clearer that modern science may not in fact have all the solutions. Therefore, integration of multiple indigenous and other ancient and land-based knowledge systems and epistemologies may also be fostered should HEIs engage significantly in research on the SDGs.
- tions are made below for the integration of the SDGs in the missions and activities of HEIs:
- Develop an institution-wide SDG action plan to begin to integrate teaching and research on the SDGs through various departments, centres and programs.
 - Assign a senior focal point in the institutional leadership to anchor the process of integrating SDGs university-wide.
 - Develop links and register with the UN SDG Secretariat Knowledge Platform.
 - Establish contacts with the country's national voluntary SDG secretariat to learn about national plans and processes for the implementation of the SDGs.
 - Integrate teaching about SDGs in the existing curricula of school and university centres and departments.
 - Make students and faculty fully aware of the SDGs and their sub-goals and indicators, as they relate to their professions and disciplines.
 - Encourage courses to be introduced across departments and faculty that focus on the SDGs from multiple disciplines.
 - Support the development of continuing education programs for professionals and citizens on different aspects of the SDGs of relevance to the local context.
 - Incentivize research that contributes to the search for innovative solutions to the SDGs of relevance to your regions.
 - Make use of the UN SDG framework to track contributions by institutional research programmes at your university.
 - Develop community-based participatory research programmes for students and faculty to undertake engaged scholarship in local SDGs.
 - Co-create city or region-wide partnerships with governments, civil society, businesses and other educational bodies to collectively support the planning, implementation and monitoring of SDGs of relevance to your regions.

Recommendations

Based on the considerations in this section and conclusions from the four highly interesting and diverse case studies presented here, several concrete recommenda-

A Regional Approach

The Latin American University: Science and Technology Seen from the Humanities – Emer(conver)ging Issues

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Abstract

The system of university disciplines and the fragmentation of its profession-oriented academic results and processes have meant that the management of new knowledge, the synergy between the humanities, science and technology, the interdisciplinary organization of the curriculum, governance structures and the representation of its main actors and communities have not been the prevailing trend. The dominant form of university is still that with a strong identity and historic roots that is closely tied to the student protests and historical contexts of the different countries, especially the legacy of the 1918 Student Reform Movement, which arose at the University of Córdoba, Argentina, and spread to most universities across the region. This mood still prevails today and the affinity remains strong. This paper not only emphasizes the historical and current context of reference, but also presents a set of emerging/converging concepts that are under debate in the Latin American and Caribbean region, with major changes in the way that science and technology are seen from the perspective of humanities, in terms of new paradigmatic, epistemic and intercultural platforms and prefigurations that have arisen at a significant number of Latin American universities.

Introduction

The university system in Latin America and the Caribbean has a Napoleonic profession-oriented tradition, and its organizational and academic structure is strongly rooted in schools and faculties, divided into tight and rigid fields of knowledge, with its research centers and institutes physically and academically separated from one other. This same scenario has been reproduced and remains predominant at most of the public universities in the region, despite all the advances that have been made in recent decades, as shown in this paper.

In June 2018, UNESCO held its Regional Conference on Higher Education in the framework of the centenary of the reform movement, which across the region had promoted and established university autonomy, co-governance (parity in the representation of students, lecturers and authorities on collegiate bodies), the right to receive a subsidy from the state, and a critical position of the university towards society, the economy and political powers. The legacy of this reform is a model that is deep-rooted in the region, but which continues to be a matter of debate and study and the cause of movements that support, resent or criticize, because of what it represents as one of the core principles on which public Latin American and Caribbean universities are based, in close relation to a pattern of scientific-technological dependence and subordination to different world powers.

Hence the final declaration of this multitudinous event (with more than 12,000 participants) reflects the conviction of the need to advance with the transformation of the region's university and higher education systems, based on a vision of science and technology from the point of view of the humanities, inter-cultural matters, inclusion and equity.

In the last two decades, knowledge management and the organization of university teaching and research have been focusing on the construction of academic spaces that operate and integrate in converging and emerging networks, associations and work teams, in order for these interdisciplinary conglomerates to be in direct correspondence with policies and programs for social inclusion, equity, and inter-cultural and regional integration, based on the identification of universities with the principles of public good, and universal human rights. It should therefore be understood that the transformation of university structures and the critical positioning of its regional tendencies are not, and should not be, an obstacle to achieving new platforms of articulation, integration, innovation, territorially and socially responsible research and reforms of the current academic systems.

This tendency to rearrange academic spaces based on social commitment and inter-culturality, and particularly the defense of the human and social sciences, without ignoring their articulation with formal and natural sciences and technology (see attached appendix), is growing, but at the local and regional levels, especially with the innovation of new branches and with additional sites being built in the most developed universities, and with the new networks and associations that have been promoted in recent years, and the new national universities that have been created in different countries in the last two decades.

According to the experience of universities in the region, this academic and organizational innovation has been encouraged in a much more coordinated manner, with the organization of research centers working in fields such as nanotechnology, genomics, biosciences, microelectronics, biotechnology, sustainability and the environment, connecting the social sciences with formal sciences, from the perspective of complexity (see Case Study), to mention just a few, as well as with others that focus on the convergence of the humanities and the arts with inter-culturality, social sciences, governance and education. There have been many recent examples of knowledge production that have successfully created systems of convergence among disciplines, in all fields of knowledge.

The most active and dynamic academic groups and networks in the region are becoming more and more aware of the fact that disciplinary lines of work are no longer sufficient or relevant by themselves to tackle

contemporary phenomena and the complexity of modern-day issues that require more coordinated efforts of epistemological transgression to attain converging and socially responsible academic management. This should be viewed as a tendency that needs to be developed as soon as possible, encompassing a greater quantity and quality of processes, especially high-level learning and research-innovation processes, as well as those associated with the work of new regional or international networks.

Winds of Change in Higher Education

In Latin America and the Caribbean, poverty affects 200 million people, of whom 88 million live in extreme poverty, and representing more than 25% of the total population. The last two decades of the last century witnessed a series of economic crises throughout the region, leading them to be dubbed 'the lost decades'⁽¹⁾, followed by other crises, such as the one of 2009. Also, on a political level, some democratic regimes have collapsed, leading to right-wing and neo-fascist governments, which have only worsened the desperate plight of millions of human beings, mostly children and young adults.

Despite an increase in gross enrollment rates in the Latin American and Caribbean higher education system, the universalization of the tertiary level continues to be a typical phenomenon of the most developed countries, where the number of university students accounts for 60% to 70% of the corresponding age group, whereas in Latin America it accounts for between 25% and 40%, with some notable exceptions, such as Cuba. Enrollment rates at the post-graduate level show even lower indicators, and are highly concentrated in five countries.

1. "Indeed, after the failure of the IMF and World Bank's Structural Adjustment Programs implemented in the region in the 1980s, the 1990s witnessed a certain economic upturn that did not however succeed in reverting the upward trend in absolute poverty rates, whereas relative poverty rates fell by 5 points in the 1990-1997 period, representing 43% of the population by the end of this period. At the same time, Latin America is still the most unequal region in the world, with the highest quintile's share of income vastly exceeding that of the lowest quintile by 10 to 16 times". See: Bonal, Xavier. "Educacion y pobreza en America Latina: reflexiones y orientaciones para nuevas agendas politicas". In: Bonal, Xavier (Editor). Globalizacion, Educacion y Pobreza en America Latina. Fundacion CIDOB, Barcelona, 2006, p. 11.

This has a negative impact on the possibilities for social mobility, job promotion, and job placement rates of graduates from secondary, upper secondary and higher education, on account of the socio-economic disparities that are reproduced in the education system⁽²⁾.

At present, the increase in the number of school age children has introduced the question of universalization and free access to education as key items on the new equity agenda for higher education systems, viewed as a step towards growth in incorporation of the corresponding age group in the contemporary processes of knowledge production and transfer, significant learning, and multiple, coordinated, relevant, significant and socially meaningful knowledge development.

According to the UNESCO Science Report: towards 2030 (2015), the break-down of enrollment by field of knowledge in Latin America is as follows: 55.8% in social and administrative sciences; 5.6% in science; 14.0% in engineering and technology; 5.6% in agriculture; 6.45% in humanities⁽³⁾.

When comparisons are made, the general panorama regarding knowledge advancement is highly unequal, as it is highly concentrated in a few countries and is not at all dynamic, due to the aforesaid factors and also the brain drain (there are more Latin American postgraduate students in US or European universities (122,806) than in the region (33,546) (p.182), low investment rates in higher education (1% or less, on average) and a concentration of doctoral studies in three particular countries: Brazil, Argentina, and Mexico. The largest investment in R&D is made by the state (60.8%) and only involves a handful of universities and researchers (p.195), most of them also

2. According to a study by the OECD (2015), the educational level of workers vis-a-vis their actual job is the lowest among its member countries, with a fall in their rate of return in recent years. This is reflected in the gap between the skills taught in the education system and the requirements of sectors of the job market (p. 21). More than half of the people classified as belonging to the 'middle class' are in the informal sector (p. 22), hence their salaries are lower than those earned by workers in the formal sector, despite having the same level of education (Idem). See OECD/CAF/UN ECLAC. (2015). Latin American Economic Outlook 2015: Education, Skills and Innovation for Development. Paris: OECD Publishing.

3. Unesco Science Report (2015). UNESCO, Paris, p. 182. "Six out of ten graduates at the bachelor level specialize in social science, compared to only about one in seven for engineering and technology. This trend contrasts starkly with that in emerging economies such as China, Korea and Singapore, where the vast majority of graduates study engineering and technology. The region has never recovered from the disaffection for the latter fields witnessed at the turn of the century" (p. 181).

concentrated in these three countries (138,653 in Brazil; 51,685 in Argentina, and 43,592 in Mexico (p. 184).

However, both the reduction in public resources and the privatization of education services (mostly only available to a small and specific population segment in accordance with their payment capabilities) have undermined the capacity of many countries to expand their education services in order to adapt to growing demands, especially in the state-run system, a situation observed even in most of the largest and most developed countries of the region. In addition to this, we must also mention the unequal conditions with regard to continuous and successful education trajectories, which are hampered by large wage and salary gaps, belonging to certain ethnic groups, gender and language issues, physical disabilities and other geographical and suburban determinants.

Debate on the Synergy between the Humanities, Science and Technology: Emerging/Converging Issues

In the following sections, the authors have selected a series of focuses, methodological and conceptual approaches and university practices and alternatives that are being developed to achieve the goal proposed for the region: to transform universities on the basis of their historical foundations and their status as a shared and social resource.

As shown, the aim of this collaborative approach is to present the way the current trend towards inequality and exclusion on a university level can be shifted towards initiatives that seek to democratize knowledge, leading to alternative efforts to build synergy between science and technology from the perspective of the social sciences, arts, culture and the humanities.

1. Social Inclusion Policies

Its history and a tendency to question the regional reality have made the Latin American university model unique. Based on political and critical reflections on education and society, its universities challenge their unequal and non-democratic societies, while advocating from within their own organizations for academic and research freedom, as well as co-governance, as a

vehicle to encourage real participation among their subjects (Leite 2018; Didriksson 2018). This brings together extracurricular, research and teaching activities with a commitment to social responsibility and integration.

A primary condition for any university to engage in social and cognitive transformation is to be committed to wholesale transformation of their own structures. In order to devise forms of social, political and cultural change that are dynamically and critically coordinated with the creation of better conditions for the development and behavior of young people in society, collaboration between universities and schools needs to be intensified in order to offer more qualified training and greater opportunities in the schooling of the young.

It is therefore a case of examining the processes with the intention of reverting any excluding mechanisms involved in the academic methods of the region, which concerns not only access to university but also the permanence of students on any given program, as there are high drop-out, absenteeism and late graduation rates. Governance needs to re-focus on building more democratic participation processes for the under-represented or excluded from the education and meaningful learning systems.

The approach presented herein not only focuses on the use of inclusion mechanisms, but also discusses the possibility of tackling the kinds of educational and social exclusion that have traditionally been produced and sustained in Latin American society.

It must be understood that the policy of 'affirmative action', as adopted in several countries in recent years, is a fundamental resource in order for certain social segments to gain access to higher education, in such a way that it facilitates dialogue with the students that constitute the new generations, most of all the sons and daughters of non-schooled parents, who could then contribute to the production of knowledge outside of traditional university settings. This is based on the understanding that students with new profiles, biographies and social backgrounds are active agents in problematizing and proposing when it comes to discussion and improvement of the public nature of higher education institutions. Their agency is directly associated with movements, causes, or even work and everyday dynamics in general. These aspects of affirmative action policies are directly related with actions that seek to enhance social insertion at university.

The sense of belonging associates the validity or relevance of higher education with social practice. This goes beyond mere insertion in the labor system, and also includes cultural democratization as well as the ability to respond to long-term social and human development needs. This sense of belonging also refers to the capacity for proposing solutions for local, regional, and global problems. As shown in the above data, the search for solutions to social problems through higher education lies in the assumption of responsibilities to fight against inequality. Among the alternatives that have emerged in the last decade, in the sense of making higher education more relevant, we can cite the commitments to strengthening basic education schools and enabling access to higher education in state-run and free-of-charge institutions, at both undergraduate and postgraduate levels, especially in the case of disadvantaged social groups.

The fact that 'affirmative inclusion policies' exist does not mean that they have been assimilated in university contexts: some institutions or specific programs have taken the initiative to implement affirmative actions that need to be organized in the short, medium and long terms in order to become truly effective, as these policies for broader access at the institutional and national levels need to be expanded.

In addition to this, affirmative actions need to be viewed as a whole; this means that they should not be restricted to merely establishing university quotas for excluded sectors. Programs should not only design mechanisms to ensure that these groups of people enroll for university courses, but it is also indispensable for permanence policies to be formulated. There is a need to fight the subtle mechanisms that limit the possibilities for students to make progress with their work and be recognized as subjects in full exercise of their rights within the institutional framework.

When developed for other social groups, affirmative policies should also be accompanied by new study and research horizons. From the moment these social groups gain access to university, topics, theories and problems related to their realities, their know-how and their experiences become valued. Therefore, education for diversity and against discrimination gains strength when curricular changes, especially to degree or undergraduate courses, are encouraged. From that moment on, society will start to find itself again and appreciate how central an issue

inequality is, and the extent to which public policy needs to be reoriented accordingly.

2. Art and Culture: Essential Components

For ten years, we have been witnessing major movements in terms of art and artistic production in the academic field, a movement that has been extended to the regional and international arena and which has had an impact on the university system.

Based on this concept, the question that needs to be asked and addressed as a problem is whether we can view artistic production as a form of knowledge production and research. And, even more so, to what extent can we view art as a form of research that transforms the notion of art and science, or, perhaps, in what sense has this already been thought, acted upon, represented, and institutionalized as knowledge reflecting an immanent process in both art and science?⁽⁴⁾ What kind of knowledge is it? How does it relate to the new production conditions that prevail in contemporary life within the framework of the so-called knowledge economies or cognitive capitalism?

The use of the term ‘artistic research’ and not research on the arts, leads us to consider the socio-political and economic conditions that have made this reconfiguration of mutually exclusive semantic fields possible, but it also warns us of the ideological assumptions that the new articulations between art, science and technology entail in the context of current socio-economic configurations.

Thus, research on the arts has thus become a field of opportunity for exploring comparative analyses and alternative research models capable of updating intersections between perception, affection and ideas. It is an expanding, wandering and erratic territory since it comes from very diverse perspectives and disciplines, and, precisely for this reason, it may blur the boundaries between solid and institutionalized fields of study.

We can broadly identify two positions that are currently under debate in the region: on the one hand, criticism of increasing control over knowledge production (in terms of accreditation mechanisms and standards) that imposes

4. At the dawn of modernity and with the founding of modern science, art and science were set apart. Art became the reserve of direct, immediately sensitive experiences that are not mediated by reason. Thus, experience and certainty became incompatible, mutually exclusive fields; experience, now within the realm of art, was definitively dismissed from the field of scientific knowledge and (because of the ideological operation that matches the universal with the particular) from the field of knowledge in general as well.

its own methodologies and evaluation criteria of artistic research to the detriment of its critical potential and, on the other hand, a conception that identifies the emerging forms of modern-day art as performativity, intangibility and creativity and places them at the epicenter of the socio-economic transformations of the knowledge society. In both cases, the role of education and art institutions must be examined in the light of the impact that artistic production has on the knowledge economy.

The former position describes the fundamental role that academic institutions play in the ever-growing knowledge commercialization process: a shift from the concept of value as objectification of material work to the idea of innovation and knowledge as intangible ‘raw materials’ to generate value in the new era of capitalism. Artistic production, traditionally on the margins of academic institutions and at the antipodes of the scientific model, would continue to be the domain of freedom and resistance. Its inclusion in the dynamics of institutional research models would cause, claims this view, a depletion of the creative powers of art: its power to transgress and displace the norm.

In our view, the latter position considers the problem in a more complex and dialectical manner. In principle, it involves considering the way that art (the aesthetic regimes that validate it and the practices in which it is deployed) connects with economic and social processes. It questions the discourse that (claiming to be the guardian of the supposedly critical purity of the work of art) merely validates the ideological model that heightens its uselessness and social marginality. It postulates the interweaving of art and its material conditions of existence since, as pointed out by W. Benjamin: “there has never been a document of culture, which is not simultaneously a document of barbarism”.

All these issues are floating on the horizon of our professional practice as teachers, researchers and stakeholders in the area of university management; they guide us and represent new challenges when it comes to design strategies and implementing projects related to artistic education.

We believe there is a need to examine the difficulties arising when formalizing higher education processes in the various artistic disciplines, incorporating criteria of technical quality, evaluation and research, with the specificity that these processes are explicitly assumed as a form of resistance to the models and standards employed as means for accreditation and professionalization at

universities, and which tend towards homogenization and internationalization, thus subordinating them to the dominant models of knowledge production. As stated at the CRES-2008, held in the city of Cartagena de Indias, Colombia: “The movement from that which is national or regional toward that which is the global (global public good) has as a consequence the strengthening of existing hegemonies.”

Thus, artistic education and research at the higher education level must generate strategies to resist the advance of a university project subjected to the demands of the World Trade Organization (WTO). Confirming autonomy as “a right and a necessary condition for unfettered academic (and artistic) work” involves understanding that autonomy is a condition for the critical involvement of knowledge with the social and cultural contexts to which it belongs.

For this reason, we believe it is essential to enumerate the objectives and principles presented in the *Buenos Aires Declaration*⁽⁵⁾, resulting from the *Regional Colloquium on the Cartagena Declaration and Contributions for the Regional Conference on Higher Education 2018*, which was held at the Universidad Nacional de las Artes in November 2017, regarding “the recognition of the strategic role of art and culture in producing socially committed knowledge and fighting for cultural sovereignty, sustainable development and the pluri-cultural integration of regions. (For this purpose) it is vital to promote specific legitimation and evaluation matrices for the teaching and learning of and research into the arts at the higher education level”.

As pointed out at the beginning, the long-awaited hierarchical organization of artistic education at the university level has managed to fill a recognized gap, but, at the same time, has served to highlight the still marginal and secondary position that has traditionally been assigned to research into the arts.

“It is vital to shorten the distances separating the scientific, technical, humanistic, social and artistic fields, while understanding the complexity and multi-dimensional nature of problems and promoting cross-cutting views, interdisciplinary work, and comprehensive training”⁽⁶⁾. There is still much more to be done in this direction.

5. Buenos Aires Declaration (in Spanish and Portuguese) available at: <https://www.priu.com.ar/coloquio-cres-declaracion-final>

6. CRES 2008 Final Declaration. Scientific, humanistic and artistic education and comprehensive sustainable development. Item 7.

We had, and still have, two choices: either we try to get education and artistic research to fit the established criteria for higher education in general or we make the University Schools of Art in the region the places to develop concrete dynamics and processes, links and practices that reformulate both the stereotyped methods of the university system and the conventional production of art. An in-depth study that recognizes the tradition of concrete practices associated with the training of artists in different areas and, at the same time, the heterogeneous processes and competences encompassed by the term ‘art’ will be fundamental for enriching the debate on the role that artistic research should play in the region.

In this sense, artistic education is a complex area, and that is precisely where its interest lies; it is more of a contradictory relationship, a disjunctive synthesis, than an easily definable homogeneous field. It is that which resists all definition. Art is a practice whereby artists explore the possibility of composing a notion made up of sensations that cannot be repeated. It opposes the mere reproduction of knowledge as imposed by present day accreditation and standardization methods. Art means resistance, as it opens up the horizon of whatever is possible and puts other modes of existence to the test⁽⁷⁾.

To claim that there is an alternative concept of art implies doing away with the old dichotomy between reflective and logical knowledge and practical and technical knowledge; between objective, intelligible knowledge that can be systematized and evaluated, and the subjective mystery of sensitive and emotional knowledge. It also implies recognizing the extent to which we are indebted to the mindset that reduces artistic creation to the private sphere, to individual aptitudes and to one’s subjective expression.

It is essential for artists to be incorporated into research teams, since they are the producers of a form of knowledge that neither scientists nor technologists can produce, i.e. the production of affects and percepts (Deleuze 1983), and the creative aspect of discovery in the production of knowledge, without which there can be no innovation.

Finally, there is a need to recognize the right to art in education, and not only in the case of higher education. As art is part of the production of knowledge, there can be

7. See Deleuze and Guattari (1993).

no school without art. To meet the objective of a possible world that is developed, sustainable and better to live in, artistic education is fundamental as it builds citizenship while avoiding discrimination and oppression.

Artistic creation is never an individual affair. It is, above all, a social and cultural matter. Any artistic creation is always a shared creation. It is about learning to think as a community, it is the thoughts that arise on the boundaries, in that blurred area in which the affirmation of difference permits the recognition of the other as one's peer. Maybe it is that utopic dimension that we must learn to teach.

3. Interculturalism: Dialectics of a Concept

In Latin America, universities must include the concept of interculturalism in every working realm. Some of the most important subjects for this cross-cutting and epistemological inclusion arise here, and represent a challenge and a transgression in the face of a hegemonic thought system, but which emerge from the reality in which the current university system lives and is organized.

The concept of interculturalism refers to respectful, horizontal and synergic interaction between cultures. It is different to an imposed, violent and colonizing relationship. It is a concept with a political dimension that is not reduced to politics. It affirms the existence of a plurality of cultures within society, where no group is above another, and there is no reason for one culture to consider itself superior to another. The relationship between different cultures is based on equality and tends towards integration within a given territory.

There are two levels within interculturality. The first refers to recognition and respect for other people's cultures; and the second implies the use of dialogue, although this process is not exempt from conflict, as it questions some of concepts from modern politics, such as the notion of a nation state. In consequence, a process is established in which interculturality modifies the traditional meaning of social struggles. Thus the plight of women cannot only be tackled from the Marxist episteme, nor solely from that of a modern philosophy that carries with it the affirmation of nationalism. The plight of indigenous people seeks reformulation of the State, and appropriation of the territory's resources.

Each of the former aspects implies a conflict with one's equals, while at the same time creating new understandings of interculturality. One thing is to be a man among an indigenous culture, and another is to be in a

mestizo culture. Something else is to be a gay man in a Muslim world, or another in an atheist world, or to be gay and rich or gay and poor. And all this is experienced in different ways depending on whether you are male or female, or a child, an adult or elderly.

The interculturality that originated in the South is different to the multiculturalism and pluralism of Northern origin, since it not only seeks recognition from other cultures, or to stress tolerance as the main political conquest, but is necessarily centered on the construction of equalitarian policies. Multiculturalism acquires meaning in cultures that are ancestrally racist; interculturality is generated in places that have condemned thousands of cultures to marginality, even for racist reasons.

The political concretion of interculturalism is subject to several variables: affirmation of diversity, protection and strengthening of languages, new forms of political organization, legitimization of their territories, insertion of their legal systems, acceptance of their native economic systems, other forms of education, and recognition of their health practices.

A primary discourse of interculturality in Latin America and the Caribbean seeks the peaceful coexistence of cultures through the recognition of cultural diversity. Interculturality is the peaceful relationship between two or more cultures. In order to reach such a level, there is a need to overcome prejudices between superior and inferior cultures, those which are sustained on the basis of racist and unfair policies. The 'Us' is confronted in its sociology of superiority.

Interculturality appears within a dynamic, sustained and permanent process of interrelation. Power relations are not mentioned, and the affirmation of equality is not so clear. This kind of interculturality is connected to conscience, and the need for participatory processes, which are distinguished from personal efforts, is stressed. The collective effort that is required for interculturality to happen condemns, in a certain way, individual work. Collectivism, it is supposed, does not occur through individual and individualizing action. Actions coming from the individual tend to be viewed as harmful.

The notion of being uncultured does not exist in this discourse; what does exist is cultural multiplicity. Everyone is born inside a culture, and culture is a reference for identity and communication. The intercultural human being is born inside cultures, is social in its being and is related with the other and the others from before birth.

Cultures are built over time through the establishment of fair, equitable and intercultural relationships. In consequence, cultures are destroyed through colonial, violent, authoritarian and imposed relations.

Such discourse presupposes open cultures. Interculturality is not an option; it is an indispensable path towards good living and self-education. It is the way in which cultures change and are modified beyond will and the expected.

There are endogenous changes to different cultures, but most changes are produced from the outside, due to exogenous factors. One culture does not tend to change on its own; it changes due to other aspects that are external to that culture. So, interculturality is usually present throughout the process of interculturality. There is no single process of dialogue, for dialogue can involve manipulation and imposition of the strong over the weak, a situation that is not seen in such discourses.

Concerns about globalization tend to be the setting of such discourse. Globalization is identified with the phenomena of homogeneity that would destroy Southern cultures, so interculturality challenges globalization. Faced by the spread of one single culture, the answer is to endorse cultural multiplicity. Two questions arise: To what extent is globalization the imposition of not one, but of multiple cultures marked by market standards? And is cultural multiplicity antagonistic or does it support the imposition of a single cultural truth?

The idealization of culture tends to contain a vision of enclosed, complete and pure culture. However, every culture is basically multicultural, i.e. it has been formed and continues to be formed from contacts between different communities and cultures, either in a violent or voluntary way, consciously or unconsciously. Therefore, there is no pure culture. In each one we find traces of other cultures, we do not know where these features came from or why, but they are the inherent features of culture.

The idealization of culture in terms of interculturality assumes that culture in itself is good. In actual fact, our cultures and the cultures of others contain key myths for understanding ourselves, but there are other nefarious aspects to the identity-building process. All culture, including Western cultures, not only have myths, but these myths are linked to superstitions, some of them harmful and potentially dangerous for humanity. Edgar Morin (2007) says that every culture contains a mixture of superstitions, fictions, fixations, accumulated and

uncriticized knowledge, gross errors and deep truths. For interculturality, it is important not to view key knowledge as superstitions and millenary knowledge, as has been common on the part of the colonizer. But above all else, the challenge is not to admit culture without being self-critical.

Another common understanding of interculturality is the affirmation of respect for differences. Policy is the guarantee of such respect. The context behind that claim is that of internal and intercontinental migration leading cultures to feel vulnerable. The generally unwelcoming cultures of the people towards which migrants are heading are major threats to their cultures. Common attitudes of xenophobia and racism are an affront to migrant lives.

Given the impossibility of accepting the other, the interculturality of differences inspires a series of security and psychological policies. Respect for differences emphasizes the physical integrity of the foreigner. Likewise, the discourse on differences accepts that, in order to value others and the other, one must value oneself. Policies implement communication strategies to change the xenophobic stereotypes among the allegedly superior culture.

Such racism brings the need for work on self-valuation, to generate attitudes of acceptance, self-security, and optimism. It is also important to look for new connections with culture. Psychological work is aimed at the acceptance of the personal being, which should lead to the acceptance of the cultural being. As can be seen, this challenge delves further inside the exposed cultures. However, in this field the results are limited if racism increases rather than decreases.

The interculturalism of differences looks to reduce intolerance and to generate the guarantee of diversity from a culture that is respectful of others. Such a position is important and meaningful from the perspective of others that are in vulnerable situations, but at the same time, this position is worrying because it is not connected to equality policies.

Interculturalism will be built as long as we learn to respect differences; notwithstanding the fact that the best way to put these conditions into place is by having a market-centered world, so it is the market that lays the foundations of tolerance for consumerism.

There is another vision of the interculturalism of differences that is a response to a more national and

indigenous context, which demands respect for heterogeneity, a demand that is written in struggles for fair and equal relationships. Mediations of the interculturality of differences involve such indicators as language, medicine, politics and education, which in actual fact are a break from ethnocentrism and the culture of the superior-inferior.

One of the problems with the interculturalism of differences is the relationship between ethnicity and class. There is no doubt that ethnicity is involved in the formation of marginal groups, and that their status as an exploited class increases racism. The questions are: is interculturality less radical when there is separation between the notions of ethnicity and poverty? Is interculturality diluted when no attempt is made to change the unfair system?

If we separate ethnicity from class, we need to accept the risk of intercultural politics. There is no interculturality without struggles to change an unfair system. However, justice is not radical if equal relations are not taken into account. Being a woman, indigenous or colored are factors that are not unconnected to capitalist exploitation. Therefore, interculturality is the recognition of differences within the conflict, so interculturality does not happen inside conflict. Interculturality has to be political.

The other form of interculturalism considers the knowledge of original cultures in relation to that of universal cultures. Knowledge is not fragmented as it is in Western sciences, and it is deep within culture. It allows for human action. In knowledge, affectivity and reason are united. The wise hold ethical authority.

Interculturality comes to the rescue of ancient knowledge. Natural medicine, binary structures, the vigesimal and decimal counting systems, plant taxonomies, animals, biotic and abiotic beings, and thought based on ancestral views of the cosmos, are the most common lines of ancestral knowledge.

Ancestral knowledge was deemed esoteric by Western sciences. Astronomy, architecture, economics, political state administration, sailing, warfare and archaeology were hidden and, in the best of cases, turned into museum pieces. Such knowledge is now beginning to be incorporated in universal scientific knowledge, not from serious debate, but from the recognition of differences and universal tolerance.

One way to build science with indigenous people is through scientific research. This involves seeking a descriptive phase, in order to set the original knowledge in its concrete state. According to Bachelard, the concrete state is the place where the spirit is recreated with the first images of phenomena and is based on philosophical literature. The problem is when research is limited to a mere description of the phenomena, because the knowledge is not then subjected to a self-critical phase, and is validated regardless.

Intercultural knowledge policies are directed at education. There is a challenge here in relation to Western education paradigms. Observation, experimentation and deductive and analytical logic are not alien to original knowledge, but its paradigms are integral, associating the subject with the object and the context, and its causality is circular and recursive.

The introduction of original knowledge to education is not only an education issue, it is a political issue too, and it means more than intellectual curiosity. It is part of life itself.

Another way to view interculturality is through its connection to the struggles with regard to plurinationalism. A plurinational state is seen as the only guarantee of interculturality, as long as it recognizes the radical differences within societies.

Plurinationality leads interculturality into the field of rights. Without a multinational state there are no rights. Plurinationality is the regulatory force against single-nation, homogeneous and mono-cultural colonial states.

In order to guarantee interculturality, the state must be reformed. Plurinationality is not only an ethnic concept; above all it is a political one. It is a concept that contains the conditions that make an indigenous life possible.

Plurinationality is a statute of life for the indigenous peoples; and a condition that is absent from modern politics. Plurinationality does not propose territorial fragmentation, political division or the destruction of the nation state. The statute that it proposes is unity within diversity. Many nations within one state.

The discourse of plurinationality is not the same as the discourse of autonomy for oligarchic and economic groups, which go against the nation state in order to commodify life.

The opposition to this type of interculturality comes from large-scale transnational enterprises, and from

governments defending their interests under the pretext of defending the national interest.

Plurinational interculturality looks to change power relations, and to transform unfair relations. Therefore, the political strength resides in the organization of indigenous people in order for them to decide on their own destiny. It is absurd to expect indigenous peoples and nations to be submitted to the fight against poverty, economic growth policies, or to the defense of the Amazon rainforest.

Over time, relationships with indigenous people have involved making them the subjects of aid policies, which is why they want a state that is respectful of those people who want to live differently.

Plurinationality and interculturality defy liberal thought and the power structure that comes from modernity. The struggles for plurinationality reveal how the fundamental rights proclaimed by European Liberalism are violent acts of colonialism.

This kind of interculturality is the most challenging in Latin America, and it recalls a comment once made by Morin: *there are times when the impossible is the only possible*. The danger is for such discriminatory rule to remain intact within indigenous groups under the primacy of autonomy policies within the same nation.

Finally, we find the discourse of interculturality attached to the European concept of multiculturalism, which grew out of a period of profound changes, with multiple crises, including the crisis of humanity due to processes of major decomposition. Along with economic, energy, food and environmental crises, there is a crisis that leads us to ask what we understand a human being to be, and what we understand being a man or a woman to mean.

Politically, multiculturalism is a consequence of the radicalism of Democracy. It is not possible to be a democrat and a racist at the same time.

Spanish feminist philosopher Rosa Cobo says that, for Europeans of either gender, *it is difficult for us to look at the other because we have been socialized in the ideology of superiority; we live in the superior culture and believe that cultures are the others*. In other words, the main challenge faced by multiculturalism concerns the ideology of superiority on which the west has been built, and which sees the other as inferior. These 'others' go to Europe or the United States to take on roles of

servitude; they go to do what the people of the west do not want to do. It is difficult for us in the west, from our positions of privilege, to understand the others who live among 'us'.

4. Regional Development, Sustainability and Higher Education Institutions in Latin America and the Caribbean: Towards the Consolidation of Meanings

Higher Education Institutions (HEI) in Latin America and The Caribbean have been constituted in the context of an oppressed, lagging, vulnerable, exploited region; development there, should it exist at all, comes in association to precariousness, and such precepts as freedom, equality and equity are peripheral elements (Sen 2000; Sen and Kliksberg 2007). In this environment, HEIs have assumed characteristics and identities that distinguish one from the other, but at the same time, unify and identify them. In a region that is blighted by the desperation and difficulty that nations must learn to deal with, HEIs offer a hint of hope, change and the chance to overcome hardship; they tend to build the new, that which is still to come, and where everything that the people yearn for converges in the hope of new interpretations, discourses, questions, fair judgment, critical and broad criteria that can achieve renewed forms of interaction and interconnection between the social, the natural, and the human, all consolidated in sustainability.

With this in mind, and considering the document that resulted from the III Regional Conference of Higher Education (CRES 2018), organized by the UNESCO International Institute for Higher Education in Latin America and The Caribbean (IESALC), the following lines highlight the priority meanings of higher education in the region. This is no minor matter, given that higher education can only be a factor for change if it has the capacity to critically observe its function in the social framework and as long as its goals and meanings are questioned, in order for them to be consolidated (Villoro 1974).

So, today more than ever, the meanings of HEIs must be linked to regional development grounded in sustainability, understood as a paradigm and an epistemic framework that integrates and generates synergies between disciplines, to cross the borders between them, and to create interdisciplinary spaces that contribute to the design of methodologies and interpretative frameworks that can enable critical analysis and the emergence of a common discourse to study

reality in all of its different and complex forms, and to help to solve problems (Gutiérrez 2012).

The following are the future goals of higher education, which we hope will subsequently help to trigger broader analysis:

- A. *Interpretation.* The core of the identity of HEIs is that they drive meaningful contributions to the production of fresh readings of reality. And if they accomplish this, they might help to visualize and clarify complex phenomena, to bring to light that which is still hidden by tradition or subjection, to outline the incomplete and to contribute to a deeper comprehension of the socio-natural and spiritual reality.
- B. *Will for integration and legitimization.* HEIs should be defined as settings that contribute to an understanding of the region as a space where synergies are formed that, operating under the concepts of sustainable development, seek local, regional and global cooperation; brotherhood among nations, the capability to legitimize and accept otherness as part of oneself and hence consolidate commitments to the design of social projects and systems to foster diversity, plurality, justice, democracy, political rights and liberties, and for these to be extended right across the region.
- C. *To foster change as a relational process of expansion, transfer and continuity.* HEIs viewed as central elements in processes of change need to broaden their capabilities and systems to become interrelated in all settings of human interaction in order to transform relationships and unfair and unequal social and individual structures.
- D. *To make education feasible.* Contemporary HEIs consider their job to involve generating spaces of experience that can trigger substantial changes to the methods and structures for interpreting the natural, the social and the human, both by university actors and by social subjects in general. The former contains two interconnected core elements: 1) education from experience is recognized as a space that gives meaning, new meanings and attributions to things in the world and to education itself, allowing the subject to organize reality and become self-realized, situated and involved in a given space and time (Honoré, 1980); 2). The educational experience on a relational level is a continuous process in which the subject is an active participant, and even the main author of their own configuration (Foucault 2014), and that of others, which is why the meaning of education must be assumed as a configuration of sustainable

identities and communities; shifting, at least on the intellectual level, from the lugubrious notion of higher education as a factory of the neoliberal subject⁽⁸⁾.

There is no doubt that socioenvironmental dynamics configure a network of tensions between different elements: environmental, scientific, technological, methodological, epistemic, political, philosophical, social, cultural, artistic, human, ideological, popular, historical and economic, to mention only some of the strains that are different reflections of vulnerability and fragility in the region, and which call upon reality itself. In such a framework, HEIs in Latin America and the Caribbean need to take on a preponderant role, with shared commitments and major awareness of what they can contribute through analysis and intervention to the reorientation of the construction of a different world, a world that is more fertile and where the seeds of freedom⁽⁹⁾ in the light of sustainable development, flourish and irradiate ferments of change.

5. Internationalization of Solidary and Academic Networks

University internationalization is a process that started in the 1980s, stimulated by the convergence of the following trends: a common academic model throughout the whole world that came from the Medieval European university system and was transferred to the rest of the globe; a growing global academic market, for students, teachers and researchers; the use of English as the internationally accepted language for research, communication and teaching; the advance of e-learning and use of Internet and new information and communication technologies in education processes; the tendency of academic institutions to associate with institutions in other countries, the creation of external campuses and the opening of franchises resulting from commercial regulations; and the standardization of certificates, courses, credits and other methods for evaluating and measuring academic progress, due to the local dissemination of internationalized regulations (Altbach 2002; Altbach and Teichler 2001; Brunner 2009; Didriksson 2008; García Guadilla 2010; Perrotta 2016).

8. See: Laval, C. and Dardot, P. (2013). *La fábrica del sujeto neoliberal*. In C. Laval and P. Dardot (Eds.), *La nueva razón del mundo, ensayos sobre la sociedad neoliberal* (pp. 325-379). Spain: Editorial Gedisa, S. A.

9. See: Villoro, L. (1974). *La educación superior*. In L. Villoro (Eds.), *Signos políticos* (p.159). Mexico: Editorial Grijalbo.

The consideration of higher education as a market good (commercial service) shook the foundations and changed the meanings of university policies around the world and shaped a competitive or Phoenician paradigm of internationalization (Perrotta 2016a). This meant the subordinated incorporation of Latin America and The Caribbean in this process (Landinelli 2008), thus increasing the divide between institutions and the countries at the center and on the peripheries (García Guadilla 2010; Perrotta 2016a). In consequence, university internationalization rose in importance on the agenda of international organizations, and in state public policies; together with debates between academics and political actors regarding the dispute between different university systems (Del Valle, Suasnábar & Montero 2017).

The reaction to these processes was immediate, both due to the mobilization of the academic sector and higher education institutions themselves, as well as university teachers' unions, and regional student federations. In the framework of these protests and responses, a central issue for higher education in our region was the conflict between the perspectives of *public good* and *market good* (Bizzozero 2006; Verger 2006); which since 2008 has been reconfigured in terms of rights versus *commodities* (Perrotta 2008, 2016a). It is important to stress that this process in the Latin American and Caribbean region has an additional edge derived from negotiations of the Free Trade Area of the Americas (FTAA) treaty of 1994 and 2005, which includes provisions for the deregulation of higher education, and which generated a transcontinental process of social upheaval (Feldfeber & Saforcada 2005).

Specifically regarding the matter of internationalization, although it is not given that name, the CEMES 1998 called for the configuration of networks as a defense strategy against the unequal distribution of global knowledge, characterizing this kind of cooperation on the principles of solidarity, mutual respect and symmetry.

The configuration of university networks enabled greater interaction among institutions and their academic communities, better use of each of their capabilities to boost individual strengths, and the establishment of new forms of integration and articulation (Zarur 2008). At the same time, these new forms of inter-university cooperation demanded the creation of synergies and complementarities, defying universities' identities (García Guadilla 2006; Krotsch 1997). Within the immediate setting of CRES 2008, international cooperation between universities was viewed as the starting point to

allow knowledge to be shared horizontally and vertically (among universities, and among less favored sectors of society), and to strengthen regional integration processes (Gazzola & Goulart Almeida, 2006).

In this context, universities need to take an international and cooperative perspective that permeates the agenda of national governments, regional organizations and higher education institutions.

The organization of knowledge production within universities

The shift towards corporate-university models has led to an increase in inequalities inside universities, generating standards that allow for cost-cutting and increased income, in many cases aimed at profit. This has led to a decline in the labor conditions and numbers of teaching and support personnel, the latter meaning cleaning, security, and transportation services. These conditions are even worse when external programs and projects, which are heavily promoted to solve funding issues, are established in order to get the university to operate like a business.

At the same time, the attack on universities from different sectors (politics, government, business, fundamentalist religious groups) that are questioning its status as a common good, critical space and place for humanist education, has been echoed internally in the form of rejection of extracurricular or 'social action' programs, the arts, humanities and social sciences, and support their de-funding and disappearance.

Hence, the already-existing inequalities between permanent and temporary faculty, between different areas of knowledge, and between different substantive activities such as teaching, research and extracurricular programs have intensified, causing internal conflicts that affect the way that resources are allocated, positions of authority are defined and the ways that different sectors compete for university funds.

As long as people in insecure jobs have no access to spaces for democratic decision inside universities, these inequalities will get nothing but worse.

Recommendations

From this perspective, universities cannot be excluded from social criticism of development systems that encourage inequality and the wellbeing of an absolute minority, and destroy the fundamental conditions for life and existence. That is why the state, from its role as guarantor of sustainable human development, must continue to demand academic integrity in the organization of universities, most especially in three strategic areas: a) respect for life and rights for life, that is, the development of alternatives for human rights as opposed to commodification, control of intimacy, individuality and dignity, the privatization of health, indiscriminate genetic and food manipulation, and neglect for the future of new generations; b) the foundations of social organization, political domains and the local, national, regional or world economies, as opposed to single-mindedness, the irreversibility of domineering and exclusionary globalization, poverty, hunger, misery, marginalization and ignorance, and the theoretical and methodological perspectives that justify them; and, c) regarding the development of alternatives for cooperation, the community, the common good, rights for all, inter and trans-culturalism, security, citizen participation, organization and representation in governments and states (Petrella 2003, UNESCO, p. 130-131).

The conditions under which this must be accomplished and the challenges implied are huge, but neither can they be addressed solely from a locally-minded and non-pragmatic perspective; nor can they be achieved, socially speaking, without *a new approach to national and regional integration agreements*, associated to the new international division of knowledge, connecting science and technology with humanities, arts and interculturality. We cannot be swayed by narrow-minded nationalism, because isolated institutions would not be able to work together to take on the great challenges of the future.

Unlike what is happening in other parts of the planet, Latin American universities build their particular past and present identity from integral institutional autonomy, a collegiate and participatory government, and have maintained a predominantly public model, with important differences between its countries, and where universities are one of the few social institutions that recurrently take a critical stance, and where both students and teachers have constantly taken action against the barbarism, injustice and excessive authoritarianism

of governments, the rich and the powerful, whether local, national or foreign. They have also stood for the defense of the public good, of liberty and equality, of human rights and even for their own existence. That is why universities should also look towards their own internal inequalities, to promote the right to dignified work and democracy throughout the academic community.

During the last two decades, public universities in the region have promoted major structural changes to their platforms for networks and associations, to their processes of regionalization and integration, to their curricula, and to their orientation towards research and scientific and technological innovation. They have also promoted excellence in the production of new knowledge, despite global indicators clearly suggesting that the region has fallen comparatively behind the rest of the world, and progress has been made in the coordination of knowledge, interculturality and the relationship between humanities and sciences.

Universities should also look towards their own internal inequalities, to promote the right to dignified work and democracy throughout the academic community

Conclusions

Synergy between the humanities and arts, science and technology is a recent academic phenomenon at universities in the region, but there is a very long tradition of creativity and social innovation in the humanities, social sciences, arts and culture where many important schools of thought have taken root and proliferated. These processes have had major social impact and worldwide recognition, especially from philosophy and artistic education. More recently, a multi and interdisciplinary process has been developed to connect the humanities, science and technology with major intercultural and sustainability content.

However, the rising tendency regarding these synergies and new processes for articulating knowledge neither represent a structural change to the region's traditional disciplinary and profession-oriented university system, nor to the higher education system as a whole, because this system continues to reproduce and rely on state resources and its relations with political power, but most of all, because there is still inequality and inequity in its structures despite the context of new cognitive and

informational configurations that are questioning and challenging the current forms of power.

There is hence a need to combat the shift towards dependence on and domination of large businesses with regard to cognitive and informational capital and genomic manipulation, together with major communication, food, transportation and finance (credit and insurance) multinationals, which relate to the debate in some academic sectors about the importance of building endogenous knowledge platforms from a relationship with different stakeholders and contexts and with the state, and which leave us in a constant state of neo-peripheral subordination (Albagli and Maciel 2011)

In some countries in the region, progress has been made in this regard, but the conflict of interests and the real power of far-right neoliberal groups, bolstered by the rising mercantilization of higher education that has been prioritized over the possibility of fostering major changes to universities to thus promote new expressions and experiences from a multiplicity of knowledge, the construction of subjects who appropriate that knowledge, and the ripping apart of scientific and technologic determinism, in order to put universities at the service of a just and fair society, from a new humanism and deep-rooted social innovation, within spaces that produce “a new commons” (Ibid, p. 130).

The challenge is to transversally link such initiatives, and for it to be the state’s duty to design a national education project that really is public and universally accessible. This is especially true in the case of Brazil, where there are still doubts in terms of the perspectives of state action, considering the forthcoming government. The responsibility of institutions and other agents in the field of higher education is, in this context, to push for these changes to happen, thus intensifying their social relevance. If this pressure is exerted together with the state in terms of public policy, then it also needs to happen in terms of human education, in shared dialogue with students about their right to a quality education, and their commitment to the construction of education as a public good.

In a broader sense, the two related practices mean the integration of science, technology, arts and innovation, because all those areas of knowledge are directly or indirectly involved. Opportunities for inclusion arise both in areas of knowledge like the humanities, and in the sciences too. In conclusion, these are innovative practices achieved through teacher training or through inclusive actions.

References

- Albagli, S. & Maciel, M. L. (2011). “Informacao, poder e política: a partir do sul, para Alem do sul” in Maciel & Albagli. *Informacao, conhecimento e poder*. Río de Janeiro: Garamond.
- Altbach, P. G. (2002). Perspectives on International Higher Education. *Change: The Magazine of Higher Learning*. Vol. 34:2, pp. 29-31.
- Altbach, P. G. & Teichler, U. (2001). Internationalization and Exchanges in a Globalized University. *Journal of Studies in International Education*. Vol. 5:1, pp. 5-25, doi: 10.1177/102831530151002
- Bizzozero, L. (2006). La educación superior en las negociaciones de comercio internacional consecuencias y desafíos para el Mercosur. *Aldea Mundo*, vol. 11:20, pp. 19-28.
- Brunner, J. J. (2009). The Bologna Process from a Latin American Perspective. *Journal of Studies in International Education*. Vol 13:4, pp. 417-438, doi: 10.1177/1028315308329805
- Bonal, X. (2006). *Globalización, educación y pobreza en América Latina: ¿hacia una nueva agenda política?* Barcelona: CIDOB Edicions.
- Del Valle, D. (comp); Montero, F., Mauro, S., Socolovsky, Y. (2017). *El derecho a la universidad en perspectiva regional*. Ciudad Autónoma de Buenos Aires. IEC: CLACSO. Available at: <http://www.memoria.fahce.unlp.edu.ar/libros/pm.762/pm.762.pdf>
- Didriksson, A. (2008). El rol de la educación superior para el desarrollo humano y social en América Latina y el Caribe, in Global University Network for Innovation (GUNi) (ed). *La educación superior en el mundo: Educación superior, nuevos retos y roles emergentes para el desarrollo humano y social*. Madrid: Mundi-prensa.
- Didriksson, A. (2018). Responsabilidad social territorial: nuevos desafíos para la autonomía universitaria, in Grimaldo, H. (coord.). *El rol de la educación superior de cara a los desafíos sociales de América Latina y el Caribe*. UNESCO- IESALC & Universidad Nacional de Córdoba.
- Feldfeber, M. and Saforcada, F. (2005). *La educación en las Cumbres de las Américas: Un análisis crítico de las políticas educativas de la última década*. Buenos Aires: Laboratorio de Políticas Públicas, Miño y Dávila.

- Foucault, M. (2014). *La hermenéutica del sujeto*. Argentina: Fondo de Cultura Económica de Argentina, S. A.
- García Guadilla, C. (2006). Financiamiento de la educación superior en América Latina. In Global University Network for Innovation (GUNI) (ed). *La educación superior en el mundo 2006: la financiación de las universidades*. Madrid: Mundi-Prensa.
- García Guadilla, C. (2010). *Educación superior comparada, El protagonismo de la internacionalización*. Caracas: UNESCO/IESALC-CENDES, Bid&Co.
- Gazzola, A.L. and Goulart, S.R. (2006). *Universidade: cooperação internacional e diversidade*. Belo Horizonte: Editora UFMG.
- Gutiérrez-Pérez, J. (2012). Condiciones óptimas para una ciencia de la sostenibilidad: implicaciones sustantivas para la investigación educativa y socioambiental contemporánea. *Rev. Ed. Pública, Cuiabá*, 21(47), pp. 571-596.
- Honoré, B. (1980). *Para una teoría de la formación. Dinámica de la formatividad*. Madrid: Narcea, S.A.
- Krotsch, P. (1997). La universidad en el proceso de integración regional: el caso del Mercosur. *Perfiles Educativos*, vol. 19:77.
- Landinelli, J. (2008). Escenarios de diversificación, diferenciación y segmentación de la educación superior en América Latina y El Caribe. In: Gazzola, A.L. and Didriksson, A. (eds). (2008). *Tendencias de la Educación Superior en América Latina y el Caribe*. Caracas: UNESCO-IESALC.
- Leite, D. (2018). Pedagogía da Reforma de Córdoba. *Integración y Conocimiento*, vol. 1, p. 00-53.
- Morin, Edgar. (2007). *La cabeza bien puesta*. Buenos Aires, Argentina: Ediciones Buena Visión.
- OECD/CAF/UN ECLAC. (2015). *Latin American Economic Outlook 2015: Education, Skills and Innovation for Development*. Paris: OECD Publishing. Doi: <https://doi.org/10.1787/leo-2015-en>.
- Perrotta, D. (2008). La cooperación en MERCOSUR: el caso de las universidades. *Temas*, Vol. 54, pp. 67-76.
- Perrotta, D. (2016). *La internacionalización de la universidad: debates globales, acciones regionales*. Los Polvorines: IEC-UNGS.
- Petrella, R. (2003). Los pilares prioritarios para la construcción de otro mundo, pp. 119-131. In Rallo, A. (ed). *Un mundo para todos: otra globalización es posible*. Icaria.
- Sen, A. (2000). *Development as freedom*. New York: Alfred A. Knopf, Inc.
- Sen, A. and Kliksberg, B. (2007). *Primero la gente. Una mirada desde la ética del desarrollo a los principales problemas del mundo globalizado*. Spain: Ediciones Deusto.
- UNESCO International Institute for Higher Education in Latin America and the Caribbean. (2008). *Declaration and action plan of the Regional Conference on Higher Education in Latin America and the Caribbean*. UNESCO Digital Library.
- UNESCO. (2018). UNESCO Science Report: towards 2030. Paris: UNESCO. Available at: <https://unesdoc.unesco.org/ark:/48223/pf0000235406>
- Verger, A. (2006). La liberalización educativa en el marco del AGCS/GATS. Analizando el estado actual de las negociaciones. *Archivos Analíticos de Políticas Educativas*. Vol 14:9, pp. 1-23.
- Villoro, L. (1974). *Signos políticos*. Mexico: Editorial Grijalbo.
- Zarur, X. (2008). Integración regional e internacionalización de la educación superior en América Latina y el Caribe. In Gazzola, A. L. and Didriksson, A. (eds.) *Tendencias de la educación superior en América Latina y el Caribe*. Caracas: IESALC-UNESCO.

Case Study — Center for Complexity Sciences (C3) - UNAM

Aurora Lechuga

The *Centro de Ciencias de la Complejidad* (Center for Complexity Sciences, C3), better known by the three Cs in its name, is one of the newest projects at the National Autonomous University of Mexico (UNAM). It began its activities as a virtual center in November 2008 with the aim of “building bridges between the exact, natural, social and humanistic sciences; between theory, experiments and computer simulations, and between basic and applied research⁽¹¹⁾”.

Its main objective is to promote links between multidisciplinary academic groups and institutions from the government, production and social sectors to incubate macro projects that respond to different challenges from the perspective of the complexity sciences.

C3 started with five research programs to develop specific projects with a focus on complex systems:

- Complexity and health,
- Systems complexity and biology,
- Ecological and environmental complexity,
- Computational intelligence and mathematical modeling,
- Social complexity.

Two more programs have since been added, which are:

- Neurosciences
- Complexity and art.

C3 directs its research at postdoctoral researchers, guest lecturers and graduate students whether or not they are enrolled at the UNAM. The initiative is extended to other higher education institutions.

At C3, various problems are tackled from the complexity approach and solved from a comprehensively transdisciplinary, multidisciplinary and interdisciplinary perspective

that links knowledge of the subsystems of scientific and humanities research, in order to resolve urgent problems that have an impact at the regional, national or global level. These issues include emerging diseases, aging and chronic degenerative diseases, computer intelligence, cancer, urban mobility, complex networks, obesity, perception of art, experimental teaching of scientific thought, socio-environmental innovation, interactive dynamics between art and complexity, computational analytics and bioinformatics, and early warnings of diseases. The main idea is to develop specific research projects in collaboration with C3 members.

The procedure for entering and remaining at C3 is as follows. First, there is a project registry at C3, whereby projects are reviewed by an academic committee and if approved, C3 offers facilities such as infrastructure (i.e. a cubicle on its facilities), seminars and group work with members from different areas of knowledge, and a whole dissemination, design, management linkage and administrative apparatus. Later, funding agreements can be made with companies or the government of Mexico City through administrative association in order for the projects to proceed in the best possible manner.

The different expected results are theses, publications, intellectual property and long-term implementation with a direct impact on society.

C3 is distinguished for hosting interdisciplinary projects that relate the most advanced knowledge in the professional realm with technical, scientific and humanistic fields of study, and generates the conditions for participation in the production of new knowledge.

It is in the articulation of interdisciplinary knowledge that the problems tackled by C3 research are modified in a quest for real and effective intervention in the social sector.

C3 is open to undergraduate or graduate professionals looking to develop high level research projects. It does not seek to diagnose or theorize about real situations; it seeks to conduct research from a holistic perspective and to present viable and immediate solutions to old or recent problems of national or worldwide relevance.

11. In September 2014, C3 was granted legal personality and authorization to have its own building and an academic-administrative structure. The new venue was opened on 28 October 2015 and academic activity officially began with the First Week of the Complexity Sciences from 17 to 20 November 2015.

Country Case — Towards a Policy on Coordination between the Humanities, Sciences and Technology: The National Council of Science and Technology (CONACYT) in the New Mexican Government

María Elena Álvarez-Buylla

Abstract

The election of Andrés Manuel López Obrador as president of Mexico brings the need for us to outline the strategic plans concerning the current government's new policies for science and technology. In general terms, the new state policies intend to safeguard our national sovereignty over the generation and application of scientific and technological knowledge and to support and strengthen rural communities in terms of the protection of their territories and biocultural resources. This will be achieved through dialogue based on collective ancestral knowledge and by fostering science targeted at in-depth understanding, prevention and solution of health, food, environmental, inequality, exclusion and violence issues to intensify social and environmental impact. Such social and environmental impact must be achieved through a series of virtuous circles towards a fairer world for everybody.

General Considerations and Guiding Principles

President Andrés Manuel López Obrador's assessment of the injustices of the neoliberal economic system and its responsibility for our national crisis is a suitable perspective from which to build the general framework for a new strategic plan for Mexico's National Council of Science and Technology (*Consejo Nacional de Ciencia y Tecnología* – CONACYT).

We are all concerned about putting our country back on course, and the need to find real and sustainable solutions for so many of the problems that are currently faced by our nation, and which are in urgent need of

concerted action by academics, scientists and technologists working in harmony with the institutions that safeguard the national interests.

The new CONACYT administration shall offer a public service based on clear epistemological and ethical principles, scientific rigor, full transparency, republican austerity and true commitment to the present and future of Mexico.

CONACYT will make decided and priority contributions to the generation of cutting-edge scientific knowledge in a variety of areas. This is science for change that will play a core role in Mexican development and sovereignty. It will also be necessary to oversee the basic scientific mission of measuring, understanding and resolving the most serious problems faced by the country. The council will also directly supervise the necessary scientific and technological efforts to orchestrate appropriate solutions to resolve future needs and challenges as previously identified by experts.

The strategic plan for the restructuring of CONACYT acknowledges that the generation of cutting-edge scientific knowledge is a fundamental source of real technological innovation, and therefore the focus will be on strengthening our national scientific capacities. Based on the precautionary principle and taking into account the inherent obsolescence of technological developments, the restructuring plan will redirect efforts towards safe, sustainable and suitable technological solutions arising from ground-breaking research that will have a real impact on the production, public and socio-environmental sectors. The core strategy will give priority to the understanding and resolution of urgent problems for the sake of greater social equality and to prevent new conflicts from arising.

CONACYT council will also directly supervise the necessary scientific and technological efforts to orchestrate appropriate solutions to resolve future needs

The social sciences and humanities shall act as sources of inspiration, questioning, and critical dialogue from an ethical, aesthetic and epistemic point of view with regard to the development of basic science and technologies. CONACYT shall encourage participation in research projects that help to foster academic conversation and discussion regarding the challenges, risks and meanings involved in social, economic and political processes of major significance in our contemporary society, as part of the efforts to take technology to society, to globalize the economy and communication, and to reduce the concentration of wealth and the spread of violence.

The core strategy will give priority to the understanding and resolution of urgent problems for the sake of greater social equality and to prevent new conflicts from arising

By recognizing the cultural significance of scientific endeavor, the CONACYT restructuring plan is well aware that the generation of scientific knowledge is corroded when it is solely focused on obtaining results in terms of market value. This has come about as a consequence of imposing a neoliberal rationale on science, technology and education. Extreme commercialization of knowledge-generation processes and of the training of high-level human resources has profound ethical implications and may even be cutting science and universities at the root. These destructive mercantile processes have generated a clash between the generation of knowledge for corporate and for public interests. The market emphasis of technology and science in the globalized neoliberal world has led to the development of dangerous technologies that offer little or no scientific benefits, and that ignore the limitations of nature, the criteria of sustainability, or any other social, humanitarian and ethical considerations. The recovery of our national industries must be grounded on the generation of breakthrough knowledge and properly evaluated and sustained technologies that are suitable for productivity, for our environment and always for the benefit of the people.

Innovations conceived to promote new public policies or for the development of new national industries only mean something if they can be adapted to and placed in the context of a mega-diverse and multicultural country like ours. Every single innovation will be offered for consideration by broad and diverse sectors of society, without being conditioned by public or private interests that have nothing to do with those of knowledge.

Innovations conceived to promote new public policies or for the development of new national industries only mean something if they can be adapted to and placed in the context of a mega-diverse and multicultural country like ours

It is essential for Mexico to have its own science and development policy that does not include, adapt to or imitate globally established models, as this only aggravates scientific and technological dependency to the detriment of our national sovereignty.

Scientific research

Scientific contributions are fundamental for the advancement of knowledge and for overcoming previous paradigms. There are different ways to do science and these may be influenced by the economic, political, cultural or even ideological contexts in each country, but scientific research always makes new contributions to knowledge. So it is wrong to distinguish between basic and applied science, and it would be more accurate to talk about science directed towards new and valuable discoveries that can help us to understand, prevent and resolve particular problems.

If we only foster science that mimics and uses the knowledge generated in other countries, then we will continue to push Mexico towards scientific and technological dependence

The primordial role of CONACYT is to support public science by boosting the national ability to create high-level human resources, making it a priority to train our Mexican scientists to revitalize science in our country. This central role of CONACYT has been perverted by the neoliberal economic system that has consumed important resources for certain knowledge production frameworks that could be viewed as irrelevant and sterile, and in which the activity of a large

number of scientific researchers is restricted in terms of production by the imposition of assessment mechanisms. Although the National System of Researchers has participated in the endorsement of scientific research and has somehow stabilized the work of a major community of scientists, it has also been the source of certain 'simulation practices', and quantity has taken pride of place over quality in scientific production.

Certain procedures involving the transfer of funds in recent years under the previous CONACYT administration have allocated a considerable proportion of these to the projects of private companies (in many cases multinationals) that were not performing any kind of practical scientific research. Moreover, technological projects have been nurtured and guided by private rather than public interests on the basis of obsolete paradigms, or using outdated knowledge that was generated abroad or in Mexico. In the best-case scenario, many of the programs supported by different funding schemes have not always been based on fair competition, but rather on the confirmation of previously known data or proposals that have already been proven in other countries.

It is crucial and a priority for CONACYT to support cutting-edge science with a long-term vision and clear criteria for its advancement, while its relevance and quality on a worldwide level should be evaluated in a fair and transparent manner. It is essential for new CONACYT policies to prioritize support for ground-breaking research at different centers and public universities in order to boost science in every area of knowledge in Mexico.

Science is the cornerstone for the cultural, human, economic and technological development of any country, so it is extremely important to support basic scientific perspectives that have traditionally been robust and have led to universally relevant cutting-edge contributions from Mexico (e.g. observational astronomy; plant and animal systematics and taxonomy; ethno-botany; sociology; anthropology; archaeology; systems biology; biomedicine; material science; ethno-linguistics, and many others). It is also very important to empower other areas of the country that have not traditionally made new contributions but which are gaining ground due to young Mexican scientists living and achieving success abroad. In this respect, it is crucial to tie CONACYT's scientific research policies to ambitious programs for scholarships, 'repatriation chairs' and the consolidation of leadership.

It is crucial and a priority for CONACYT to support cutting-edge science with a long-term vision and clear criteria for its advancement, while its relevance and quality on a worldwide level should be evaluated in a fair and transparent manner

Some specific actions have already been proposed following consultations with a large group of national researchers, and which will be formally evaluated by the new CONACYT administration, are as follows:

Implementation of qualitative indicators for the evaluation, assignment and monitoring of funds

CONACYT will redefine the deliverables demanded by the national scientific community during auditing processes, such as publications, the training of human resources, the dissemination of scientific knowledge and links between the social and production spheres. Qualitative criteria based on in-depth independent analysis will be prioritized and will be different from those applied in other areas of public administration. This redefinition of criteria shall be applied from a multi-sectorial perspective that will take into account the opinion of the national scientific community, will create ad-hoc commissions and turn to international experts to avoid arbitrary decisions. Qualitative indicators will prevent the scientific fraud that is so closely linked to the current quantitative evaluation criteria based on all-out competition. CONACYT will support a zero-tolerance policy and will consider the inclusion of respect for the human rights of the scientific community by creating a suitable legal body in that respect. The granting of public funds will be conditional to unrestricted respect for a code of ethics grounded on accountability and human rights.

Based on accurate diagnostics, CONACYT will deal with the publication of results in non-scientifically legitimated journals, and will oversee the creation of a national program for the supervision of procedures for the publication of scientific results that will include a database taken from indexed journals that reward real impact factor rather than the number of publications. A Latin America-wide program will be launched to boost regional capacities for the dissemination of scientific knowledge and that will be able to negotiate with international networks of science publications to ensure that scientific results generated by public funding are made available for unrestricted public access.

Thorough review of the structure and efficiency of administrative procedures to guarantee short-term results.

CONACYT pledges to review its organizational structure and administrative procedures in order to avoid the constant delays that have been so typical of calls for funding. This structural review will establish the purpose of each Associate Director or Area Director and their essential duties will be defined to guarantee results in accordance with established deadlines. To ensure better performance, continuous evaluation mechanisms will be implanted to monitor administrative operations in line with the new administration's decentralization policy, and standards of shared management with the governmental administration will be promoted.

Targeted research

Although basic and cutting-edge sciences are the main sources of innovation, it is also important to direct a considerable part of national scientific endeavor towards certain areas to promote scientific development and new methods and approaches in certain priority areas in Mexico. If this is associated with formal diagnoses of the biggest national issues, they will be easier to resolve without causing further aggravation and even preventing fatalities. This difficult task demands new approaches to cutting-edge science with the support of state-of-the-art, and especially smart technologies. CONACYT will support the development of national capacities to meet this challenge using complex multi-disciplinary and multi-sectorial systems, just like the problems that we are dealing with.

Some of the challenges, though not limited to the same, where funds could be directed to guide basic science are the following:

1. Research into the integration and promotion of clean industries and the generation of socio-environmentally sustainable renewable energies, to encourage the development of new regional and national industries from an autonomous and community perspective that are focused on generating energy on a local level and in a culturally appropriate manner. Assessment of the socio-environmental impact of industries (on a community, regional and national level) and industrial innovations to minimize the impact of waste and pollution, encouraging recycling, and optimizing the use of raw materials and energetic self-sufficiency.
2. Science and technology for sustainable urban development without damage to the health and environment, which must be culturally appropriate and aimed at the restoration of the balance between opportunities in both urban and rural settings.
3. Development of national industries based on state-of-the-art and environmentally friendly technologies to solve, prevent and comprehend priority national issues.
4. Assessment of the authorities responsible for monitoring and risk-management of natural disasters (earthquakes, tsunamis, floods, storms, cyclones, etc.) and climate change. Evaluation of the possibility of CONACYT administering all of these authorities, including CENAPRED, and in collaboration with other public authorities (e.g. National Autonomous University of Mexico (UNAM), the Federal Government and the State Governments) to guarantee that they receive sufficient funding and perform to the optimal level. Promote programs to establish the best preventive and reactive mechanisms with regard to national disasters in coordination with other Federal Government departments.
5. A preventive, systemic and social approach to health to support a reduction in public expenditure that will significantly prevent poorer populations from being the ones that suffer the most. Innovation to decrease the incidence and progression of chronic degenerative diseases like cancer, diabetes, renal disease, obesity and cardiovascular diseases, among others; citizen science, communities of practice and self-administered healthcare will be used to attend to the mental health of patients' families. National pharmaceutical policies that favor the prevention rather than cure of diseases will be encouraged, and assistance shall be provided with the reversion of certain critical stages to preclinical or healthy stages, with a stronger focus on the most common illnesses that affect the national population. Prioritize research that unravels the causes, processes and systemic mechanisms involved in outbreaks of diseases, rather than focusing only on symptoms. Support research seeking to understand the factors underlying proper child development and the measures to prevent and make an early diagnosis of problems, and therapeutic methods to revert or reduce the effects of developmental disorders. All of this will be done from a social diagnostic approach.
6. Innovation of agro-ecological systems and other sustainable plant and animal production systems, fisheries, etc. Build platforms to promote solidarity networks for

the production and consumption of healthy, diverse, local and culturally appropriate foods, maximizing quality and benefit for the peasant communities and also for human and animal health. Encourage studies to promote and evaluate livestock conditions and the use of chemicals that affect human health.

7. Together with points (5) and (6) the aim is to develop a series of programs to foster healthy eating habits from multi and trans-disciplinary approaches. To increase the effectiveness of this, certain agreements will be made with other government departments (the Secretariats of Culture, Public Education, Health and Social Development, and The National Institute of Indigenous Peoples (INI), among others), with organizations from civil society, private and public schools, and also with communities. In this field, a citizen science program will be set up to investigate how eating habits affect well-being and to monitor different programs in relation to health. There will be a particular focus on innovation in social and psychological methodologies and approaches to encourage healthy eating, plus coordination with other governmental authorities and with civil society to regulate the sale of soft drinks, junk food, etc.
8. Investigation, cartographic review and revaluation of Mexico's geology, fresh and coastal waters, substratum and biotic wealth in collaboration with local communities and social movements based on the context of a comprehensive and systemic vision of caring for our autochthonous territories. The plan is to explore different ways of conserving and sustainably exploiting these resources in a way that benefits local communities and the general population, in light of the fact that all of the wealth in these biocultural territories is a common asset.
9. Investigation, cartographic review and revaluation of Mexico's linguistic and cultural wealth in collaboration with local communities based on the context of a comprehensive and systemic vision of caring for our cultural wealth, our local legacy and history and the collective rights of the original and mestizo people of the country for the consolidation of dignified, non-devalued identities and equal conditions.
10. Establishment of horizontal dialogue regarding knowledge with the autochthonous people, the ages-old native science of Mexico and the ancestral forms of producing knowledge and legacy, which are among our country's greatest riches. In this field, basic exploration has been undertaken in areas such as traditional herbal medicine, autochthonous optimization of a wide variety of native crops, traditional agro-ecological practices such as Milpa agriculture, vis a vis the approaches, knowledge and tools of Western science to protect this wealth and advance knowledge in areas where Western science has failed or has been limited. Biocultural wealth, including traditional knowledge and technologies, must be protected against any attempt at privatization.
11. Diagnosis, evaluation and development of critical qualitative research of the serious migration problems in the country. The neoliberal context and the resulting neglect of the countryside and rural activities have favored the indiscriminate concentration of the population in large cities, leading to an increase in the marginalization and vulnerability of large sections of the population. Mexico, as a transit zone for transnational migrants towards the Global North, and as an emitter of its own population, needs to encourage extensive research in this field.
12. Diagnosis and visibility of racism and social exclusion. Although the social sciences (anthropology, history, sociology, etc.) in Mexico have appreciated the diversity and cultural wealth that makes up this nation, the long-term negative effects of modernization processes have included the persistent breach of the rights of large sections of the population on racial grounds. This program will support research to diagnose and produce instruments that could mitigate this situation.
13. Diagnosis, visibility and creation of our own categories to understand the excessive violence in this country. Organized crime, corporate-state violence, the precarious rule of law in Mexico, the ominous increase in forced disappearance reported by international organizations, together with other kinds of violence (femicide, murder of journalists and young people, bullying, intra-family violence, sexual exploitation), demand rigorous and urgent scientific policies, beyond criminal and/or civil inquiry).
14. Visibility and development of research linked to several forms of gender inequality and violence. Studies of gender studies and femicide show that this is a key factor in the determination of inequalities, violence and social exclusion. The gender factor needs to be mainstreamed. Scientific research into different indicators on this specific issue will help to change a situation that has historically been one of the shortcomings of public management and administration policies.

15. Establishment of national information technology ecosystems designed to culturally strengthen the national population through the acquisition of cognitive tools centered on self-confidence, respect for others and our biocultural environment.

Towards a new evaluation system

CONACYT will put together a legal structure to supervise and authorize scientific and technological research programs conducted outside of the national system of public funding. The priority will be to monitor socio-environmental dangers, whereby CONACYT will act as a catalyst for multisectorial orchestration of veto mechanisms based on the precautionary principle with regard to potentially risky research programs. Committees formed by scientists and relevant representatives of other national and international sectors will evaluate these programs and their potential impacts.

As part of the new CONACYT program, a National Information Ecosystem focused on Social Change will be created, which will also suppose a substantial contribution by CONACYT to the generation of cutting-edge knowledge to support strategic planning of the priorities for future research and the most paradigmatic and urgent cases requiring attention.

The National Information Ecosystem will also develop different smart technologies to promote decentralized and community-rooted citizen science. To do so, CONACYT will create a group of young expert researchers in various areas of the so-called Data and Complexity Sciences.

These researchers may continue with their scientific studies and the development of their talents while also serving a public function. This scientific core will be responsible for combining their efforts with other research centers and groups to set up an association to coordinate different cutting-edge programs concerning diagnostics and the proof of hypotheses in areas that require urgent attention. Priority will be given to those areas that promote a better balance in the positive repercussions of science and technology, and also with regard to its adverse effects on health, the environment, etc.

In order to ensure effective state governance when guiding national efforts in science and technology, these will need to be discussed in the legal sphere under terms of the law. The supervision of science funding and the budgets of different government departments will

be taken into consideration during these discussions. A decentralization program is absolutely necessary for ensuring efficient national planning, but to do so, the state will require a stronger capacity to supervise the consumption of resources.

Science, Art, Humanities and Technologies

From a critical point of view, the humanities must be able to generate (on the basis of aesthetic, ethical-political, philosophical, cultural, artistic, psychological and technological research) the awareness to take a critical view of the conditions for life and coexistence in our time. This complementary approach to education will be a framework for critical analysis from a perspective that should only include rational and instrumental considerations.

The fundamental purpose of this program is to foster social conscience and awareness among schoolchildren, through the coordination of educational procedures centered on the interaction between science, humanities, arts and technology. Awareness is a human faculty that can be nurtured through cognitive, relational and sensorial enrichment in a framework that includes communal collectivism.

The fundamental purpose of this program is to foster social conscience and awareness among schoolchildren, through the coordination of educational procedures centered on the interaction between science, humanities, arts and technology.

This transversal program has been designed as a school guidance project that integrates the institutional efforts of the Secretariats of Education and Culture and the National Council of Science and Technology in collaboration with the philanthropic sector for the promotion of scientific vocations. This guidance is offered in the form of a series of sensory-play workshops during primary and secondary education. The teachers are trained at research centers that deal with complex national issues by specialists (scientists, artists, humanists, instructors and technologists) in acquired educational strategies to apprehend the feelings and intentions of others.

Science, the socially validated repository of objectivity, enhances the human capacity to apprehend reality in every shape and form. In this regard, the interaction between art, science, technologies and humanities, when directed at social change, fosters the development of critical and intuitive thinking in the community

in order to explain complex phenomena. The new CONACYT administration, in collaboration with the Secretariats of Education and Culture, among others, will lead programs for interaction between art, science, humanities and technology, anchored in the visualization of social problems of major importance: violence, migration, illnesses and the environment, climate change, social inequity, gender inequality, and others. Priority will be given to national programs linked to regional areas and entities associated with the national museum sector, to build bridges between the national artistic community and the academic fields of science, humanities and technology. The achievements of these programs will arise from the diagnosis of the needs and potentialities of the national sectors involved therein. Students on bachelor and postgraduate degrees related with this topic will be supported academically and may even receive international training. This program will be linked to CONACYT's social bridging work, including study of the possibility of CONACYT sponsoring the creation and decentralization of new museum spaces (e.g. UNAM Museum of Light).

Coordination with the community and civil society

Support will be given to the participation of civil organizations in order to generate and coordinate citizen science endeavors and programs, whose results will be incorporated in the CONACYT information ecosystem. Public access to these results will be unrestricted and they will be updated in real time following review of criteria for registration for CONACYT, and new programs may be requested. It is of major importance for every program supported by CONACYT to appoint an autonomous social officer to oversee participation and to ensure the proper use of resources.

The program will look to generate synergies leading to programs to develop innovative methodologies for more effective communication of science, particularly concerning advances in pedagogic, educational and communication technologies. Work will also be done to improve communication to facilitate access to science by groups at the greatest risk with the scarcest resources. The participation and collaboration of pedagogic institutions, science communication offices and other organizations concerned with this project (such as SOMEDICyT, A.C. and the Consulting Forum for Science and Technology, A.C.) will be sought for this program.

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Inclusion and Equity

Science communication must foster and increase the participation and knowledge of vulnerable groups, and encourage diversity in science. Special attention will be drawn to the achievements of women, indigenous communities and people with disabilities in different areas of science. Work will be done with the SEP (General Direction of Indigenous Education (DGEI) and in the special education area of the Office of Curricular Development (DGDC)) and with community museums, communities of juvenile delinquents and institutions for the education of disabled students, in order to develop, offer and run activities for the communication of science and to support the specific needs of each group.

Public budget for science and technology and other sources of funding

State budget entities will be told to strictly comply with their legal commitment to assigning 1% of GDP to Science and Technology. Public funding of Science and Technology should be used to allocate funds in accordance with the rigorously established criteria proposed by this program, preventing their use for political ends or private profit, as has sometimes happened in the past. To do so, it is proposed that sectorial and regional funds should be reviewed in order to maximize the amounts invested in cutting-edge science and to ensure that they are effectively applied to the solution of the problems in each sector. It will be important to homogenize the criteria for the allocation of funds to Science and Technology and to avoid their misuse for non-scientific purposes and ensure that they are invested in the priority social and environmental areas as defined by this program. Management will be efficient and shall employ a zero tolerance policy with regard to corruption, and it will be governed by the principles set forth by this program. Likewise, the different programs for scientific and technological development that have already been implemented will be carefully reviewed in order to assess whether they need to be discontinued or restructured.

Conclusions

This document has presented the general outline for the restructuring of the General Council of Science and Technology in keeping with the state operations as embodied in the Alternative Nation Project (2018-2024) issued by the National Regeneration Movement as part of Andrés Manuel López Obrador's presidential campaign.

The restructuring program is targeted at the extreme defense of the public interest and the recovery of state governance of developmental projects in Mexico, articulated around the stipulated mandates and restrictions: legality and the fight against corruption and poverty, the recovery of peace, financial viability, gender equality and sustainable development

The deployment of the restructuring program, with decentralization and republican austerity at its core, will be accompanied by permanent diagnosis procedures in keeping with the new methods of state management introduced as a result of the victory of the National Regeneration Movement.

Special Contribution

The Union for the Mediterranean (UfM) perspective in promoting Higher Education in the Mediterranean

Higher Education and Research Division – Secretariat of the Union for the Mediterranean

The Union for the Mediterranean (UfM) is a Euro-Mediterranean intergovernmental organization bringing together all 28 countries of the European Union and 15 countries of the Southern and Eastern Mediterranean, with an aim is to addressing three strategic objectives: human development, stability, and regional integration. In order to fulfill this mission, the 43 countries work together on several axes, including higher education and vocational training, research and innovation, environment, water, blue economy, energy and climate action, and education for sustainable development⁽¹⁾. As an organization uniquely positioned to bridge and strengthen dialogue across the shores of the Mediterranean, with a focus on Human and Sustainable Development, the UfM aims to advance towards a Positive Agenda based on achieving the 2030 UN Sustainable Development Goals (SDGs) in the region by addressing the UfM's axis of work in a cross-cutting, results-focused, and dialogue-based manner.

The Mediterranean region has one of the highest rates of unemployment in the world. As such, the UfM is engaged in the implementation of specific projects and initiatives focused on the development of employability skills, business and employment opportunities, with a particular emphasis on youth and women. Special attention is also devoted to universities and university networks, their students, researchers, and academic staff, as vectors for innovation and economic growth in the Mediterranean region. Considering the potential of higher education to increase employability, promote intercultural dialogue and sustainable development, and prevent extremism, regional cooperation efforts on vocational training, Education for Sustainable Development in all of its forms, and mobility, play an essential role in achieving a positive agenda for youth in the Mediterranean (which is of particular importance in a region where almost 60% of the population is below the age of 30). In this context, the UfM works towards guiding and advancing higher education and research objectives of Member States' across all of its thematic axes.

Strategic objectives of the UfM regarding higher education and research strategy also include:

- Advancing the Mediterranean mobility agenda - which includes addressing common challenges affecting its progress;
- Supporting efforts to prepare students for the changing nature of work, enhancing their employability and improving transitions to employment;
- Enhancing the consolidation of Euro-Mediterranean academic consortia, networks and communities - from rector to teacher and international relations manager levels;
- Facilitating Higher Education to migrants, refugees and displaced persons.
- Supporting all initiatives in favor of Education on Sustainable Development in the Mediterranean.
- Contributing to regional dialogue on innovation policies;
- Strengthening regional cooperation in R&I aimed at understanding and addressing the root causes of migrations;
- Improving brain circulation and engagement with the scientific diaspora;
- Supporting regional efforts to increase knowledge and technology transfer across the Mediterranean as well as efforts to transfer research results into policy decision-making.
- Contribute to the implementation of the 2017 Ministerial Declaration on Strengthening Cooperation through Research and innovation (in particular with regards to PRIMA, BLUEMED, and migration).

The UfM also participates in and supports The Global University Network for Innovation (GUNI), as a network currently composed of over 220 members from 78 countries, and including UNESCO Chairs in Higher Education, higher education institutions, research centers and networks dedicated to innovation and higher education as a social commitment. Following the collaboration initiated on the occasion of the **GUNi International Conference on Sustainable Development Goals: 'Actors and Implementation'**, held in September 2017, GUNI and the Secretariat of the Union for the Mediterranean successfully established a cooperation framework in 2018 for the upcoming three years through the signature of a memorandum of understanding (MoU) aimed at continuing to work together in accordance with the mission and objectives of both institutions.

In this context, the UfM Secretariat continues to strive towards giving a voice to experts coming from the Euro-Mediterranean region and, in particular, from the Southern Mediterranean rim, always with a view to ensuring the visibility and perspectives of women and youth. Indeed, Higher Education (including vocational training), research and innovation have been priority areas in the mandate of the Union for the Mediterranean since its establishment in 2008, and as indicated in the UfM Roadmap for Action adopted in January 2017 by the Ministers of Foreign Affairs of all Member States.

Higher Education, as well as Research and Innovation, are critical in order to successfully address and overcome the unprecedented challenges faced by the Mediterranean region, including climate change, youth unemployment, and preventing radicalization and terrorism through the promotion of intercultural dialogue. The role of Humanities as well as Social Sciences, Culture and Arts becomes key in addressing these challenges, but also when exploiting the existing untapped potential to build more inclusive, ethic, diverse, committed and democratic societies.

From among the more than 50 labeled projects benefiting from the political endorsement of the UfM countries, shown below is a sample of the UfM's most active and emblematic projects regarding its commitment to research, innovation, and higher education with special emphasis on the role and importance of social sciences and humanities.

The Euro-Mediterranean University of Fes (UEMF)

is a regional center of excellence based in Morocco that promotes dialogue, intercultural exchange and knowledge sharing. The UEMF seeks to build a new generation of young people with a unique Euro-Mediterranean profile, who can actively play a role in transforming the region from their future positions. Students from both Engineering and Humanities & Social Sciences backgrounds receive cross-cutting classes on Euro-Mediterranean history, civilizations, heritage and languages along with transversal courses on ICTs and entrepreneurship. Social responsibility, eco-citizenship and multiculturalism are among the core pedagogical pillars of the University, mainstreamed into all study programs. The University delivers degrees focusing on the integrated development of the Mediterranean region (i.e. Master's programmes in Renewable Energy & Energy Efficiency or in Environmental Engineering & Water Management).

The UfM Secretariat also envisages playing a role in maximizing interactions and synergies among other regional universities, networks of higher education, institutions, and research centers (crucial for fostering knowledge, critical thinking, creativity and the development of personal and professional skills for the future of the region, especially youth) by becoming a focal point for collaboration among such stakeholders, thus amplifying the impact of their actions on the ground. In particular, the UfM aims to enhance its role as a regional platform for Mediterranean Higher Education and youth mobility. Indeed, academic mobility has always been at the core of the UfM strategy because of its capacity to boost creativity, the flow of ideas, and the reinforcement of dialogue and mutual understanding. In recent years, several University networks (close partners of the Union for the Mediterranean in the Higher Education field) have pledged, through different fora, to provide Humanities with the importance they deserve, in particular when it comes to shaping the region's response to the unprecedented societal and environmental challenges it currently faces.

1. The UfM works at three main levels: 1). Political (including UfM Ministerial Meetings that build on the joint agenda of the countries), 2). Regional dialogue platforms, and 3). Projects with regional impact (i.e. those labelled by the 43 countries).

The Mediterranean Universities Union (UNIMED) launched in December 2017 a *Manifesto for a new Mediterranean of Knowledge*. This Manifesto, endorsed by almost 50 institutions, calls for the need to grant Social Sciences, Humanities and Arts a more prominent role in Euro-Mediterranean Education and Research cooperation strategies and programs, as a tool to foster more sustainable development of the Mediterranean basin and the resilience of its citizens.

Another example is the **Arab-Euro Conference on Higher Education (AECHE)**; an initiative promoted by the University of Barcelona, which gathers annually all members of the European University Association (EUA) and of the Association of Arab Universities (AARU). In the final statement at the 4th edition of AECHE, held in Rabat in 2017, partners affirmed that cooperation between European and Arab Universities could benefit from interdisciplinary and multidisciplinary approaches, which all too often are still not getting full recognition and support. At the same time, they expressed their concerns regarding how the role of Social Sciences and Humanities applied to the research and study global challenges (including food and water insecurity) is often ignored.

EMUNI University hosts the **Jean Monnet project Knowledge Hub on the Euro-Mediterranean region (MED-HUB)**. This project was born with the view of reinforcing the links between academia and policy makers in order to efficiently translate knowledge on the Euro-Mediterranean region into relevant policy actions, which raises, in turn, new and meaningful research questions. In this regard, a community of experts and academics in the field of Euro-Mediterranean studies has been created, with great potential to contribute to regional integration.

In the field of Research and Innovation, the **PRIMA project on water resources and agro-food systems** was one of the main topics of the Ministerial Conference on Strengthening Euro-Mediterranean Cooperation through Research and Innovation (Valletta, May 2017). PRIMA proposes in its Work Plan for 2019 an integrated approach involving as many stakeholders as possible and embracing inter and transdisciplinary perspectives by engaging a wider diversity of disciplines including Social Sciences and Humanities.

Through its dossier on 'Environment, Water, and Blue Economy', the UfM has also been strongly involved in the extension to the South and East Mediterranean Countries

of the **BLUEMED Initiative**⁽²⁾. Endorsed by the UfM Ministers through the 2015 UfM Ministerial on Blue Economy, the BLUEMED Initiative addresses research and innovation from a multidisciplinary approach linking economy, environment and humans. The ultimate mission of BLUEMED is to design a shared research and innovation pattern to foster blue growth in the Mediterranean area, namely through the BLUEMED Strategic Research and Innovation Agenda (SRIA). This living document, resulting from a consultation process at national level and open to inputs, aims to identify, highlight and address strategic priorities of societal relevance in the Mediterranean area. The UfM is also currently working on accompanying these states in the SRIA prioritization process in order to reach a consensus on its most pressing goals and actions. A number of awareness and capacity-building sessions have also been organized in non-EU UfM countries (BLUEMED days), as well as Research Funders' Workshops.

In pursuit of the UfM's mission and following the will of its Member States, the Ministers of Environment of the UfM also endorsed the **Mediterranean Strategy on Education for Sustainable Development (MSESD)** at the UfM Ministerial Meeting on Environment and Climate of 13 May 2014 in Athens. The aim of the MSESD is to encourage countries of the Mediterranean region to develop and incorporate Education for Sustainable Development into their formal education systems, in all relevant subjects, and including non-formal and informal education. The MSESD has already yielded positive results at regional level, and innovative multi-stakeholder projects have been developed and labelled by the Union for the Mediterranean. **The UfM-labelled project "Forming responsible citizens"** (initiated in 2016), for instance, has contributed to establishing schools as key vehicles to disseminate citizenship and gender equality values in the Euro-Mediterranean region. The project sustained the creation of a new curricular guide to citizenship education (which was implemented in pilot Moroccan and Tunisian schools), aiming to encompass the concepts of inclusive and sustainable development. This new pedagogical material was also implemented in and supported by teacher training and innovative practices.

As education for sustainable development under the MSESD must take into account local, subnational, national and regional circumstances, it may place varying

2. During the event 'BLUEMED - A Basin for Research Innovation and Sustainable Growth' (Malta, 18-19 April 2017), BLUEMED formally opened to non-EU countries of the Mediterranean area interested in joining.

degrees of emphasis on the different aspects of sustainable development, depending on the country and the field of education. This Strategy will serve as a flexible framework for the countries of the region, given that the implementation of the MSES is driven by countries' priorities, initiatives and specific needs and circumstances. In response to the UfM-endorsed MSES, the Action Plan of the Mediterranean Strategy on Education for Sustainable Development was unanimously adopted, with the participation of the Secretariat of the UfM, at the high-level Ministerial Conference held in Nicosia (Cyprus) on 8-9 December 2016. As part of the UfM's commitment to follow-up on the Nicosia Ministerial Conference, the UfM Secretariat also participated, in November 2017 and June 2019, at the first two meetings of the Mediterranean Committee on ESD.

ESD is still developing as a broad and comprehensive concept, encompassing interrelated environmental, economic and social issues. It broadens the concept of environmental education (EE), which has increasingly addressed a wide range of development challenges.

In order to turn the Mediterranean into a space of innovation and knowledge transfer at the service of sustainable economic growth in the region, the Humanities have a key role to play in spreading awareness of a common heritage and opportunities for establishing a **Euro-Mediterranean Area of Higher Education**.

The UfM encourages all actors involved in Higher Education, Research and Innovation in the Mediterranean region to rise to the challenge of contributing to a paradigm shift around the role and application of humanities and social sciences vis-à-vis the complex, evolving, and deeply inter-disciplinary challenges currently facing the region.

***The Union for the Mediterranean (UfM) is an inter-governmental Euro-Mediterranean organisation which brings together all 28 countries of the European Union and 15 countries of the Southern and Eastern Mediterranean. UfM's mission is to enhance regional cooperation, dialogue and the implementation of projects and initiatives with tangible impact on our citizens, with an emphasis on young people and women, in order to address the three strategic objectives of the region: stability, human development and integration.*

Regional cooperation efforts in the fields of higher education, research and innovation as well as vocational training and mobility play an essential role in achieving

a Positive agenda for the Youth in the Mediterranean because of their potential on increasing employability, promoting intercultural dialogue and preventing extremism. The activities of the UfM in the area of Higher Education and Research aim to contribute to the Global Development Agenda, particularly to the achievement of the 2030 Sustainable Development Goal (SDG) 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, the SDG 8-6: Reduce the proportion of youth not in employment, education or training (NEETs) and SDGs where research and innovation play a crucial role.

Special Contribution

Humanities and Higher Education: Synergies between Science, Technology and Humanities – The Role of “la Caixa” Foundation

Àngel Font

“la Caixa” Foundation is fully committed to improving education and research. *The Fourth Industrial Revolution* or digital revolution is posing important challenges. The education system must progress and identify what will be valued in the labour market. From the perspective of cognitive knowledge, science, technology, engineering and mathematics (STEM) will be key disciplines, as will be attributes that are less replaceable by technology, that is, exclusive to the human being, such as creativity, motivation, innovation, cooperation, intuition, ability to communicate and undertake, persuasion and originality.

“la Caixa” Foundation is aware of the relevance of generating synergies between science, technology and humanities in order to be prepared for the future. This entails investing directly in education and research but also in facilitating a space for cultural dissemination, teaching and debate. “la Caixa” Foundation works and will continue to work to offer programs that will help with this huge transformation. Some of the most relevant projects that it funds in this area are the following.

Fellowships

Training excellence, research and innovation are crucial for addressing future challenges. There is no doubt that more research implies more social progress. Since 1982 “la Caixa” has been offering fellowships for postgraduate studies abroad, and for doctorates and postdoctorates later on.

Created in 1982, the most traditional of the different programmes is devoted to funding postgraduate fellows to study abroad (120 fellowships in 2018). This programme provides the finest Spanish students with access to the best universities in Europe, North America (USA and Canada) and the Asia-Pacific region (Austral-

ia, China, Singapore, Japan, India and South Korea). These fellowships are for a maximum duration of two years. Since its inception, this international programme has generously funded more than 3,400 fellows to take postgraduate studies in any discipline, including the arts and music.

In 2018, “la Caixa” launched a new postdoctoral fellowship programme to attract and retain the best talent in Spain. Thanks to this programme, 30 researchers of excellence of all nationalities are currently developing their top-level, innovative scientific careers in Spanish universities and research centres.

In 2018, the “la Caixa” fellowship programme also offered other types of grants, such as the doctoral programme in Spain (20 in total) and INPhINIT doctoral programme (57), co-funded by the European Commission through its Horizon 2020 MSCA COFUND programme. These programmes are also aimed at researchers of all nationalities with the dual objective of attracting and retaining the best research talent. Both these doctoral and postdoctoral fellowships are therefore offered in two categories. The first is ‘Incoming’, which is aimed at attracting talent to Spanish research centres accredited with excellence in the fields of life sciences and health, technology, physics, engineering and mathematics. The second is ‘Retention’, which aims to retain the best researchers in all disciplines wishing to conduct their research at any university or research centre in Spain. In both cases, these are three-year fellowships.

The doctoral and postdoctoral fellowships in Spain include workshops on technology transfer, professional development and cross-cutting skills in order to enhance professional development and improve career opportunities for researchers. Additionally, this training programme aims to provide researchers not only with tools, but also with the proper awareness and skills to engage with society in order to deliver a common

good. These sessions are taught by representatives of leading companies in these fields. The training is also complemented by networking activities to encourage collaboration between “la Caixa” fellowship holders.

Research

Support for leading centres through calls for pioneering projects is a key element for addressing the main challenges of the future, such as health. 2018 brought the first edition of a private call for research projects in biomedicine and health that made the Foundation one of Europe’s leading philanthropic research entities.

Accordingly, 20 research programmes of scientific excellence and great potential value and social impact were chosen in the first Call for Research Projects in Biomedicine and Health. The aim of this open, competitive call is to promote projects of excellence in the fight against diseases with the biggest world impact, such as cardiovascular, neurological, infectious and oncological diseases. “la Caixa” Foundation allocated a total of 12 million euros to the call, to which the Government of Portugal added 2.2 million.

In addition, “la Caixa” Foundation gives support to research centres of excellence. For instance, the foundation is one of the main donors and founders of the future SJD Paediatric Cancer Centre in Barcelona, together with other foundations, thanks to which Hospital Sant Joan de Déu began operations in 2018 on what will be one of the biggest paediatric oncology centres in Europe.

“la Caixa” also works hand in hand with IrsiCaixa and ISGlobal, two research centres focusing on AIDS and infectious diseases respectively. “la Caixa”’s commitment to the long-term support of IrsiCaixa and ISGlobal continues to yield great results. A total of 489 scientific articles were published by the two centres in 2018.

IrsiCaixa is leading research for the eradication of HIV/AIDS and their related diseases. Major advances have been made in experimental treatments against AIDS using stem cells. Recently, a group of scientists from IrsiCaixa discovered that filoviruses, a family that encompasses such viruses as Ebola, share with HIV a pathway to cells in the immune system, and has designed antibodies that totally block this pathway in human cells. The work was published in June 2019 in the journal *Nature Microbiology*.

For its part, in 2019 ISGlobal was awarded accreditation as a Severo Ochoa Centre of Excellence by the State Agency for Research. This distinction recognizes the excellence and scientific contributions of national and international research centres, their social and business impact, and their ability to attract talent. ISGlobal is the first global health centre in Spain to receive the distinction, which aims to finance and accredit public research centres and units that include frontier and highly competitive research programs and are among the best in the world in their respective areas. The awarding of this four-year grant involves one million euros of funding per year, in addition to preferential access to scientific facilities, flexibility in the recruitment of researchers, and fundraising. The aid received will allow ISGlobal to create three new research groups: mobile health technology for diagnosis and risk assessment; data science and mass data (big data), and impact assessment on health and implementation science.

ISGlobal is committed to improving health in a globalised world and hence devotes substantial efforts to investigating the effect of climate change on health. A new study led by ISGlobal has added new evidence: exposure to polluting particles during gestation and the first years of life is associated with a reduction in cognitive abilities. According to the research, which was published in *Environmental Health Perspectives*, the cognitive abilities that are most affected by pollution are working memory, a cognitive system that stores information for later use and that is fundamental for learning, reasoning, problem-solving and understanding language, and executive attention, one of the three networks involved in the capacity for attention, as well as the ability to detect and resolve conflicts.

Innovation

The CaixaImpulse programme, which bridges the gap from laboratory to market and society, promoted 78 programmes in 2018 and has created 13 spin-offs since its launch, providing solutions that benefit human health. CaixaImpulse aims to transform the scientific knowledge arising from non-profit research centres, universities and hospitals working on innovative projects in the field of biotechnology or life sciences into services and products that can generate value for society. This is achieved by creating new companies or by technology transfer agreements, such as licenses.

Knowledge brokering

The transfer of research into policy and practice is a complex process that both policymakers and researchers struggle with. A potential solution is to use individuals or organisations as knowledge brokers, whose role is to make research and practice more mutually accessible. “la Caixa” Foundation has various instruments that support knowledge brokering.

“La Caixa” Social Observatory

This programme focuses on studying and understanding social problems, and making them known to the public and specifically to policymakers and practitioners who deal with urgent social issues. One of the main subjects discussed at the “la Caixa” Social Observatory is education. It does so from a broad perspective and regularly publishes articles written by top experts discussing the main evidence in this area. Some examples of available articles are:

- Parental involvement in education: a tool for change.
- Training for employed people: the need for expansion and improvement.
- The new generation of digital technologies in Spain.
- Public and private universities: evolution of productivity and impact of the crisis

European School of Humanities

The *European School of Humanities* is a programme supported by “la Caixa” Foundation through offices at Palau Macaya. It promotes awareness, training and cultural debate, with four main levels of activity:

- General courses on the humanities directed at a non-specialised audience, in order to offer a complementary space to university education.
- Expert seminars on specific aspects of European humanist culture, linked to the present and from a perspective that complements the political and journalistic debate.
- Public conferences and debates by both national and international cultural professors and researchers.
- Creation of a reference web site to disseminate the materials created by the School and to build a community around it.

The *European School of Humanities* adopts the European cultural space as its own framework, with the idea of establishing a European outlook on affairs and creating the conditions for greater European cultural transversality. In a world undergoing a rapid process of change, the humanities are more necessary than ever as a point of reference to evaluate these transformations; Europe and the humanities as coordinating elements of a school aimed at citizens and promoting citizenship.

Europe as a perspective, Europe as a referential territory, and European cultural mind-set as the object of study: Humanities (including economics) as those scientific, cultural and artistic disciplines that have human experience as the central object of study.

Social Research Call

In 2019, “la Caixa” Foundation launched a new call for social research projects of excellence that rely on data to provide robust quantitative evidence and insights about current and emerging social challenges from an original and innovative approach. This call was open to researchers from all disciplines who focus on current or emerging social challenges, shedding light on social phenomena and providing a better understanding or measurement of social interactions in the context of Spain. This project makes 1.3 million euros available to 100,000 euro projects of up to 24 months duration.

Editors' Conclusions and Recommendations

David Bueno, Josep Casanovas, Marina Garcés, Josep M. Vilalta

This report was not produced in abstract form, but has instead raised questions in the real context of higher education in the world. We did not want to perform a speculative exercise on what the relationship between the humanities, science and technology should be in the ideal world, but instead we have addressed active members of the academic, cultural and institutional community around the world to find out what is happening, what changes they perceive, what their limits are and what their potentialities are. What synergies are occurring? Which are not occurring? Why not? Which views do we share and which are driving us apart? What initiatives are being experienced? And what recommendations, proposals and good practices can we share at this early stage of the 21st century so that all these words do not end up being no more than good intentions?

A report like this, produced over two years of dialogue with colleagues in as many countries and disciplines as we have been able to bring together, is not about self-congratulation. In fact, it is quite the opposite. It needs to serve as the springboard towards the demand and desire for change that most of us participants share. We have found that when asked about the role of the humanities in the context of current changes, everyone has good things to say. From politicians, to technicians, regulators, academics from different fields and financiers, everyone is convinced that humanistic education and cultural experience are key factors for a more dignified, fairer and more democratic society. The problem is that the reality of the education and research system is far removed from these good intentions. Specific decisions in terms of funding, salaries, teaching hours and social assessment of the humanities and culture are sending out a contrasting message: that the humanities are dispensable and a complement, even an ornament. We have produced this report from the conviction that this situation must be changed both in theory and in practice and that there are important reasons for doing so. This report should therefore be viewed as the open expression of a commitment shared by many different voices.

The reasons for these changes that we want to help to promote relate to the biggest challenges and changes of our time. We have arranged these into three core areas:

1. those that have to do with environmental and climatic issues, which put our relationship as human beings with all other living beings and resources on the planet in crisis, and which are calling for a reappraisal of the very conditions for life (habitability, survival and diversity),
2. those that have to do with scientific and technological changes, which are presenting new possibilities in terms of robotics, artificial intelligence and big data, as well as developments that are still hard to imagine in the fields of biomedicine and life sciences, and
3. those derived from the cultural changes in a world where the West and patriarchy are no longer the sole hegemony, as we shift away from the Eurocentric, chauvinistic paradigm that has prevailed among mankind until now.

These are not three separate sets of questions. Rather, all three overlap as we redefine the boundaries of a way of understanding civilisation that has been based on the continuous and unlimited spread of its power, its dominion and its ideas for the future. As a global world, we are experiencing the limits of a finite planet and of a mortal species, we humans, who are the cause of the widespread threat to our own living conditions, together with those of other living beings and ecosystems on this planet. It is not that the planet is too small for our aspirations. The planet is neither big nor small, it is what it is. What we may need to reconsider is our aspirations, their meaning and their consequences, as well as the way in which these aspirations are to be put into practice.

We have learned, throughout the modern era, progress does not work as a straight line along which we advance in stages. The path we are taking is full of potholes and new abysses that we ourselves are causing. Society as a whole is participating in this process, albeit with different privileges and responsibilities. We could try to draw a general map of these interactions, but what interests us is to understand what role and responsibility the world's higher education system has to play when it comes to contributing to a better appraisal of mankind's hopes and expectations.

General considerations

We are not interested in the question about how the humanities should be adapted or modernised on the basis of scientific or technological changes. There is a very large market of 'new humanities' that only seem to add apparently innovative adjectives to a legacy that they do not question. This report takes a different point of view: we want to focus on the need to think together, from all areas of knowledge, about the shared problems of our time. What role can the humanities play in this common challenge? This is not only a question for humanists. The different sciences and different technological practices also have a vision of the world that they transmit and often impose through institutions and the market. So, it is a question that we all have to ask together. And 'all together' also means from the different levels and responsibilities of the university system, from senior governors to students, scholars, assistants and users, who are increasingly more diverse, fleeting and unstable.

Thinking together about the relationship between the different fields and practices of knowledge and the specific situation of the humanities within the context of current changes has led us to question the higher education system as a whole. And although it is beyond the scope of this report, this also means the education system all the way up from elementary, primary and secondary education, for they are the foundations for higher education, which to a large extent conditions what they do. The shared questioning that has come out of this report has led to three general considerations that we would like to emphasise:

- First of all, that in most of the opinions we have gathered, the humanities are no longer viewed only as a series of disciplines but as a way of addressing and understanding human experience in all its manifestations. Their existence and focus conditions the conception of the general paradigm of knowledge that we are developing in other areas and disciplines of knowledge. So, it is not a case of working out how we can keep a place for subjects like literature, history, philosophy, art and so forth, but of how we can guarantee and accompany sufficiently consistent education in all these fields, and how this can have an impact on the knowledge system as a whole.
- This means, secondly, that the question about the place of the humanities in the system has led us to the need

to rethink everything. This means that the report, as a whole, may sometimes have too abstract or general a tone. We should make it clear that this is not because we have avoided being too specific, but because the specific problems we face today have to do with the rules of play that are determining the global higher education system as a whole. Changing just one part is the start of changing everything.

- Thirdly, despite the differences in local political, cultural, economic and other contexts, the higher education system appears to be far more similar around the world than we thought, both in terms of its problems and of the solutions being tested. This is something we have perceived as the different contributions arrived and that it is reaffirmed when the full report is read, to quite a startling extent. This speaks to us of a system that despite being institutionally heterogeneous, nationally diverse and economically very unequal is today a global system where changes spread very quickly and have an immediate effect on the specific ways that each place works. The danger of this is that any trend soon becomes strong and apparently irreversible. The positive side of this is that if we properly coordinate the focus of critical debate and its follow-up, then the drive for major change will also catch on quickly. We hope this report will help to do that.

GUNi decided to make this desire to put everyone on the same page to be its first stance, and entrusted the coordination of the book to three people from different fields and backgrounds: a biologist, a philosopher and an engineer. The personal and professional relationship between these three coordinators throughout the period in which the report was being put together was in itself an unusual experiment given the way the university system usually works. There are commissions that involve representatives of different disciplines, but each of these is usually only there to represent their own area and play their own separate part. In this case, the challenge was to generate an integrative shared framework and formulate the questions together from the beginning, bringing together languages that are not always easy to share, and also receiving the responses together, as well as proposals made by the members of the international editorial committee and the contributing authors to the report.

After two years of collective effort, this final document collects some of the most important conclusions that we have reached. They are not a complete summary

of the report. What we present hereinafter is a reasoned sequence of some of the ideas that we want to put forward as a starting point for later studies, as thought-provoking material for readers and, above all, to contribute to the debate and the transformation of a higher education system that must not shirk its present and future responsibilities. We have grouped the conclusions around the following questions:

- What education?
- What knowledge?
- What humanism?
- What research?
- What impact?
- What institutions?
- What equality?
- What professions?
- What ethics?

What education?

- C1. Education means access to a dignified life for everyone and for society as a whole. We need to distinguish between education for instruction and for training. Education does not aim to create people who are able to function better, but people who are aware of their place in the world and their relationships with others and with the environment. This is the only way that can we speak of true skills that contribute to higher levels of both personal and collective freedom and dignity.
- C2. The education system has increasingly focused on the training of skilled professionals. This tendency becomes clearer as we advance through the education process, from primary school to higher education. The entire education system needs to be rectified in order to reliably promote the principle whereby education is a right and a common good. UNESCO's *Rethinking education: towards a global common good?* (2015)⁽¹⁾ report, published as part of the debate on sustainable development and the Post-2015 Agenda, defends this new humanist view of education and the need to overcome "dichotomies between cognitive, emotional and ethical aspects" and "promote awareness of and a sense of responsibility for others" (UNESCO, 2015).
- C3. Education involves the entire education system, from the first years and throughout life. We stress the importance of a general base and the cross-cutting presence of the humanities in all areas and levels of education. We cannot advance with the production of more cross-cutting knowledge if from the outset we are learning each subject in such a segmented, disciplinary and self-referential way. Integration of the fields of knowledge begins with a good basic education that offers the chance to move freely between different problems and languages, and to use them in an interdisciplinary manner in order to solve all kinds of questions or problems. The humanities are not just a part of the education curriculum. Instead, they are an important part of the basic ability to relate the meaning of the different learning experiences that we will have throughout our lives.
- C4. Similarly, several contributions have highlighted the importance of artistic education in all areas of knowledge, including within university courses and even research. Artistic education does not mean general culture about the history of art or more access to cultural products or events. It means learning to be actively aware of the methodologies of creation and research that contemporary artistic practices can contribute to all areas of knowledge.
- C5. Education right now is highly focused on methodological innovation in the classroom, although this has not reached all higher education institutions. A recurring argument in the different articles is that such changes are necessary in order for them to truly respond to the challenges of our time. A lot of innovation merely consists of the uncritical incorporation of new technologies, which do not always satisfy true educational interests, but rather the interests of the corporations that promote them. It is clear, from all points of view, the university system needs to think hard about the way it teaches and how people should be educated in the world today. And this question will not be answered by making changes to teaching dynamics and channels. We need to diversify the spaces and types of learning at university while creating environments that 'conjoin' perspectives, both inside and outside of higher education institution. Higher education institutions must also encourage a critical and analytical spirit among professionals and citizens, and skills based on the four pillars of education: learning to know, to do, to be and to live together.

1. <http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Cairo/images/RethinkingEducation.pdf>

C6. Regarding universities and education there is a shared concern in many parts of the world about the loss of value and recognition of teaching within the higher education system. The notion of an 'academic' today privileges those people who work in research, which is the most valued activity. Meanwhile, the role of teachers has become unstable and is the lowest of functions. Universities hence face the paradox of being education institutions in which teaching is increasingly less valued and where the value attached to researchers has left the relevance of teaching in the shadows in terms of the creation of quality knowledge.

What knowledge?

- C7. Knowledge is not neutral content, but the ever-changing result of a set of practices that produce certain visions of the world and of ourselves, and which therefore condition the direction taken by new knowledge and views of the world. Talking about knowledge is talking about these practices, their complexity, their prejudices, their power relations and their consequence. So, a critical approach to the historical past is also essential in order to understand the events and contexts that have brought us to where we are.
- C8. Knowledge is therefore not the result of a single point of view or a privileged vantage point. Higher education institutions cannot be that either, nor aspire to neutrality. One of the clearest views among the contributions to this report is the defence of epistemological plurality in all fields, including those of science and technology. This means, first, a historical review of how certain hegemonic conceptions of knowledge have been reached on the basis of the dominance of the West and patriarchy on all the cultures and populations of the world. Defence of epistemological pluralism, secondly, means welcoming it and putting it into practice within the higher education system by opening it up to inclusive paradigms of knowledge. This implies not only studying the cultures of others (other ethnicities, cultures, genders and social classes) but considering them from reciprocity and from their legitimacy.
- C9. One of the most serious problems faced by the current hegemonic system of knowledge is hyper-specialisation and its effects on our experience and conception of the world and of ourselves. We need to distinguish between necessary specialisation and banal specialisation, guarantee good basic education in all fields, and work towards more holistic perspectives and the convergence of knowledge. It is not easy to strike a balance between these two dimensions and everyone cannot know everything. The important thing is to work on shared visions and practices that mediate between languages, goals, procedures, infrastructures and assessment systems.
- C10. Dualisms are the foundations of modern Western culture and the knowledge system has been organised on the basis of two oppositions: the science/arts opposition and the theory/practice opposition. Learning to think about common problems and integrate thoughtful, resolute, speculative and transformative approaches involves overcoming these two dualisms.
- C11. We are living in a knowledge society where there is alarmingly growth in resistance to knowledge, contempt for analysis and certainty and deliberate production of confusion and ignorance as a way to control public opinion, even among the most educated. We need to develop strategies that contribute to affirmative yet also pensive and critical knowledge. Confidence in knowledge can only grow if it is exposed to shared and open criticism, from calculated reasoning.
- C12. In this knowledge society, higher education institutions no longer hold the monopoly on the creation and dissemination of knowledge, which is increasingly more widely distributed. HEIs will have a greater role in teaching critical and analytical skills to citizens and future professionals, as well as developing, complementing and disseminating knowledge in close collaboration with other parties (organisations, institutions, companies, administration, civil society and the students themselves).
- C13. Many of the articles indicate that interesting crossovers between disciplines are already happening, driven by the possibility of answering old questions with new technologies. It is not just about having new tools, but about the way these new tools change our perception and concept of what we are studying. This is the case, for example, with the current crossover between archaeology and biology (archaeo-genetics), which is generating a new idea of our past. We need to move forward with the creation of multidisciplinary work teams that really do have the capacity to work together, something that courses are not doing very often at present, and where there is a particular lack of input from the humanities.

- C14. The knowledge economy is as extractivist as the other areas of the capitalist economy. Cognitive extractivism is focused today on data mining, following on from other forms of knowledge extraction (biopiracy, unfair south-north transfer, seizure of ancestral knowledge and so on). We need to work on developing a social knowledge economy that responds in a complex and coordinated fashion to the principle that knowledge is a common good, as well as on forms of exchange, appraisal, ownership and institutionality that are consistent with this principle. Experiences with intellectual property, commons and open forms of socialising knowledge are manifold and in recent decades have been reflected in many both practical and theoretical proposals that the university system has kept at a distance from its decision-making and assessment centres. Many members of academic communities are now calling for serious attention and responses to this challenge.
- C15. We cannot speak of knowledge if it is not capable of generating meaning. Knowledge is that set of relationships that allow us to make a significant experience out of our environment, respond to it and transform it. Such interpretation of experiences should not be confused with processing of information. All knowledge needs a context and certain tools in order to be interpreted. So, the humanities or a humanistic and social approach to science and technology are fundamental.

What humanism?

- C16. The humanities often speak in the name of human experience and give it an ever open and changing meaning. They are shaped with a view to answering the question “Who are we?” There is no single ‘we’, nor is it homogeneous. Every collective subject that says ‘we’ (be that a scientific community, an institution, a group, a nation, users of a particular technology, or whatever) is a complex, heterogeneous reality in which tensions and antagonisms are crossed. The sciences and different technological practices must also ask this question and open up their inner tensions, since science and technology are not homogeneous either, and nor do they speak for the same ‘we’.
- C17. Modern humanism had put the ideal of man in on a higher plane than other living beings, and anthropocentrism has also placed the human race in an exceptional and superior position over other animals. Both humanism and anthropocentrism are based, moreover, on a rigid distinction between the human and non-human worlds, be that the natural world or the artificial world (the human being as something separate and superior with respect to nature and things). At present, science and technology, philosophical thinking and contemporary humanities are all working towards a review of the links between human and non-human, natural and artificial. This is happening in studies of the brain and intelligence, in the field of life sciences and in the development of technologies that are blurring the boundaries between these ‘kingdoms’. The meaning of this re-encounter between man and nature, and between nature and culture, is not clear, hence the relevance of the debates in Post-humanism and Trans-humanism. The developments could be dangerous and dogmatic, of a neo-authoritarian and technocratic nature, or the opposite could occur, whereby an opportunity will arise for us to re-connect reciprocally and integrally with that which was previously separate and hierarchized. The conclusion here is that the debate on these issues must be shared by all the agents involved, in a theoretical and practical manner.

What research?

- C18. There is a very widespread desire for implicated and committed research. Research systems have often created very closed circuits of citations and self-reference, which ultimately make the research system (projects, publications, impacts and so forth) self-fulfilling and unaccountable to society and bereft of any duty to share the problems that it works on with the affected groups and contexts. Recent developments have included, among others, the concept of Responsible Innovation and Research (European Commission) to better align the research process and its results with the values, needs and expectations of modern society in accordance with criteria based on ethics, equality and participation. In this regard, there has been an increase in the concepts and practices of citizen science, co-creation and participatory research, which seek to encourage a variety of actors to engage in the research process. However, the system in general is far from embracing these changes and academics often have a dual agenda when it comes to getting their knowledge and research practices to reach beyond the most research-producing circuit. Different ways of creating and valuing this implication need to be devised, from the humility of being aware that the most decisive social changes do not come from academia, which must therefore learn to receive, listen and accompany.

- C19. One of the problems with the segmentation of research is that the basic academic architecture still operates by faculties and departments for all purposes and huge efforts are required in order to overcome these divisions (management of staff, projects, funds and so on). There is an indispensable need to set up cross-cutting research centres, organised around problems more than disciplines and connected with local and international contexts.
- C20. Research methods are also far too standardised. Such rigid assessment procedures make it very difficult to experiment with more creative research and take risks. This is a problem that affects all areas of knowledge, so it is another challenge that we can confront together. It would be interesting to incorporate methodologies that have been employed of late in less formal environments, such as the worlds of arts, social activism and education, and which promote reciprocity, research-action and bottom-up dynamics.
- C21. Research has serious communication problems. Who is researched for and how is research reported? Communication is not easy, not even within the academic system itself, as it is hard for research to be passed from one field to another. Congresses and publications are aimed at extremely closed communities around the same disciplines and specialisations. We need to create other channels to report and share research that, while maintaining the same level of rigor and demands, is expressed in a more accessible language to specialists in other fields, thus creating more cross-cutting contexts of exchange.
- C22. Along similar lines to the previous conclusion, research needs to be transparent and accessible to society. Some universities and institutions are already committed to the shift towards open science but, as some of the contributions to the report point out, we must ensure that these ideas are more than a mere statement of good intentions and are instead plans for real change on a number of decision-making levels and that will have an effect on the way research is evaluated and funded. There is also abundant (and good quality) research that is done outside of higher education institutions or research centres, in high level science and technology companies. This implies the need to establish stable and even 'regulated' ties between the two worlds to enable permeability, reciprocity, trust and fair play, all based on a more holistic view of public and private research in universities and companies.

- C23. One of the biggest difficulties when it comes to generating a more dynamic relationship between the humanities and other scientific and technological practices is the issue of research funding. There are major differences between the procedures, budgets, and public and private organisations that are interested in funding research and they operate within highly disproportionate budget brackets. If we are to shift the focus towards committed, transparent and open research that can create new spaces for debate between disciplines and with society, we must also review the mechanisms for its proper funding and prevent the humanities from being relegated to a merely voluntary or decorative role in any project that is considered important.

What impact?

- C24. Rankings culture has had a strong impact on the crisis of the humanities in the current university system. This competitive focus of the academic system has resulted in a loss of appreciation of epistemological diversity and a reorientation of humanistic research towards products that are comparable to those of the most valued science (in English, based on data analysis and quickly publishable in cited journals). Publication in specialised journals as a key element for measuring research quality is out of keeping with the pace and dynamics of humanistic endeavour, where the ideas and contributions with the greatest impact often occur outside the system of specialised journals and in timeframes that can be very slow and disjointed.
- C25. It is essential for research assessment systems to be developed that are capable of gathering the effects of experimental, creative, transparent and open research in all of its diversity of expressions. Impact is not synonymous with utility or performance. Impact is not a place in a ranking. Impact is to generate appreciable and necessary change in relation to shared problems, contexts and needs. If the university system ignores everything that does not generate value in a certain and highly restricted way, then all these activities depart the academic setting (for cultural institutions, social entities, independent institutes, and so forth) and it is the university itself that loses richness, diversity and relevance.
- C26. The main impact of the humanities is to link knowledge to the existing society, to analyse and explain changes, to raise and overcome problems and to interrelate differ-

ent social components. They are therefore essential for building communities and fostering mutual exchange.

What institutions?

- C27. Higher education institutions are institutions of knowledge that play a key role in society's development. The way they are valued by administrations and by society differs from one local context to another. But there is a general tendency for them to be abused by administrations and disconnected from society's interests. Universities are public and/or public service institutions and, as such, we must defend their social importance, in their different institutional formats, and ensure that that importance is respected in equal measure to their responsibilities. This commitment is the condition by which their value must be defended and, at the same time, the excessively utilitarian tendency that universities have been suffering in recent years must be reverted.
- C28. The balance between university autonomy and accountability to society is not easy to achieve. Universities need to have a sufficient level of autonomy in order to do their work in the best possible conditions, but they should also use this autonomy to meet the needs of the societies in which they operate. This balance has been increasingly tipped in recent years, along with a crisis of academic freedom around the world, even in 'consolidated' democracies, where the authorities have threatened to close institutions and restrict some areas of knowledge. That is why we must reaffirm the democratic spirit and values of higher education, but always under the umbrella of responsibility.
- C29. Universities cannot be closed environments. They need to operate as ecosystems of relationships and as cultural agents linked to their local and global contexts. They must host, support and continue communities of practices associated to shared problems, for example by fostering social innovation. This means demolishing the new ivory towers and putting an end to self-replicating complacency and moving towards porous, welcoming and reciprocal forms of institutionality. The relationship between the university and society has often been reduced to a relationship between the (often public) research system and its applications to the corporate world. This university-society relationship needs to be changed to include all those aspects that make this bond a collective right, of non-university stakeholders too, and ensure commitment to society as a whole.
- C30. Universities are also places of experience where the body, sensitivity and coexistence of the people that use them (the whole university community and its professionals) can partake in a learning and knowledge experience that affects and transforms their lives and their surroundings. This means that university and higher education centres in general have to be more student-focused, following the path that has already been taken at primary schools in many parts of the world, and must reorient their activities, spaces and dynamics towards a shared quest to find responses to their challenges and concerns.
- C31. The organisation of universities around the world continues to be dominated by the departmental, faculty structure, despite the exceptions and attempts at change. Horizontal collaboration between departments must be encouraged, by means of convergence strategies based on intellectual cross-pollination between peers. Rather than top-down changes to structures, it is important to lay the bases for a conceptual and epistemological negotiation that is bottom-up and between peers. This is how we can guarantee that the structural changes to our universities are made on solid foundations and have real effects on the ways that knowledge and experience are produced.
- C32. Interdisciplinarity (or transdisciplinarity) also means interinstitutionality (or transinstitutionality). One problem when it comes to a more humanistic approach to science and technology as a whole is that at universities it is generally very difficult to forge organised and on-going relations with other types institutions, despite the existence of rare but highly successful experiences. The humanities and the arts, on the other hand, are deployed in a very wide range of institutions (museums, theatres, libraries, cultural centres, small enterprises, cultural and entertainment companies, and others). In the context of the knowledge society, where knowledge is increasingly distributed, universities viewed as relational ecosystems must learn to work in a streamlined manner within the logic, timeframes and decisions of other institutions.
- C33. The international community, led by the United Nations, has pledged to work towards the 2030 Agenda and the Sustainable Development Goals. Many universities have adhered to these and are guiding their teaching, research and functions in accordance with the goals. This is an opportunity to position academic activity in terms of cross-cutting commitment, based on real

learning situations with inter-institutional and inter-disciplinary repercussions. However, we must ensure that such commitment to the SDGs is more than a mere statement of intent, as has been the case with previous goals set by international organisations, but is instead a path towards action.

C34. In the framework of a global and interdependent world, we need to strike a new deal between higher education institutions and societies that takes into account the dual nature of these institutions' commitments to the local needs of the societies in which they operate and to global challenges. We must recognise that higher education institutions are places where many and often contradictory demands coincide. As set out in HEIW6, the most appropriate approach involves an integrative vision: "Universities need to be key institutions at the regional level. They must seek to contribute to the development of immediate society through teaching, research and knowledge transfer, and involve themselves in establishing regional strategy in conjunction with local authorities, social agents and civic representatives. But they must also aspire to be globally engaged institutions that educate open-minded, critical and aware citizens, and whose research activity helps to define global lines of action leading to a fair and sustainable world"⁽²⁾.

What equality?

C35. Universities, as institutions, continue to have a serious problem with the participation of women in positions of senior responsibility and at the highest levels of decision. At a time when gender studies and equality plans are being intensely developed in much of the world, university governance structures also need to respond to the challenges raised by this turn in affairs.

C36 The role and presence of women in the university system has changed a lot in recent decades. In fact, studies tell us that there are many women working in the university system now and many female students are taking courses that do not always get them as far as they could. However, the presence of women is highly unbalanced in different local contexts, by areas of knowledge and in terms of status, decision and representation within the

2. Adapted from the introduction to the abridged version of Higher Education in the World Report 6 - Towards a Socially Responsible University: Balancing the Global with the Local. page 53 <http://www.guninetwork.org/report/higher-education-world-6>

system. The further we delve into the hierarchical structure of the system, the fewer women we find. The barriers to such promotion are mainly organisational and social, and start to brew during childhood, through social references that are often transmitted subconsciously.

C37. The meaning of feminist struggles is no longer solely about equal rights, salaries and recognition, but also the need to readdress the relationship between life and work, the value of caregiving and the value of a working career. Many women could but do not want to carry on the same life they have had until now and that many of their male colleagues continue to have, while many men are beginning to reappraise their own relationship with the different spheres of personal and academic life. The pursuit of effective equality today therefore means reappraising the conditions of an academic career, one's relationship with life (which is not only about balance with family life) and the sense of ambition. Change of to these mind-sets is also an academic task in which all disciplines must be involved.

C38. There is no equality without social justice. Universities have historically oscillated between being elitist, segregating institutions and becoming spaces for the democratisation of knowledge and contributing to greater equality and social justice. We currently perceive a worrying new wave of segregation and elitism among universities, with differences depending on local contexts. In increasingly more complex and unequal societies, universities committed to the task of making a pensive, critical and emancipatory knowledge system possible need to serve as agents responsible for working towards greater equity and justice.

C39. The problem of equality also involves a cultural aspect that is affected by the linguistic hegemonies of each era. Culture has always been developed in a context of tension between *linguae francae* (such as Latin, French or currently English) and the diversity of the languages that have forged the different cultures and their social ties. The *lingua franca* must not be a language of domination and hierarchisation of knowledge, nor must it impoverish the epistemological and cultural ecosystems of each setting. That is why universities must safeguard non-invasive coexistence between the use of languages for communication and fostering the use of local languages as drivers of academia and culture at the highest level.

C40. The environment is an intrinsic part of social justice. The climate crisis and the radical alteration of ecosystems,

with the extinction of species, the draining of resources and the devastation of habitats not only require technical responses but also an endeavour shared by academics, people of culture, companies, administration and civil society in general in order to resituate ourselves in relation to the world in which we live.

What professions?

- C41. The university system must educate creative, thoughtful, critical and committed professionals who are capable of perceiving the relevance of their research in relation to its contexts and other opinions, and who are competent enough to foster the changes required on a personal and collective level. To do this, the professionals working at universities (lecturers and researchers) must also meet these conditions, and pass them on to new professionals. That is, they must also be creative, thoughtful, critical, committed and self-changing, and be aware of the need for trans-disciplinarity and trans-institutionality.
- C42. One of the challenges of the modern university system is to prepare and train people for professions that do not yet exist. It is not enough to have good applied or technical training, as students must also be provided with tools to redefine their skills and abilities as necessary throughout life. The consequences of this for curricula, the attitude to be transmitted and the skills to be developed are much greater than universities have been assuming until now. In many cases, this challenge is only reflected in the capacity to adapt to a changing, flexible labour market. But we need to go further and train people with a critical capacity and an understanding of the world in which they will be developing their personal and collective projects, and help to decide on the direction that this future is going to take. The humanities, as a diverse production of the meaning of past and future human experience, are an indispensable tool.
- C43. The other major challenge for universities in the current scenario of global capitalism is the increasing loss of jobs, linked to radical changes in the methods and means of production and distribution, due to the digital revolution and robotisation, and the declining importance of labour as a production factor and generator of value. There is talk of 'workless' capitalism, which does not mean a system where everyone works less, in equal conditions, but rather the expulsion of a large part of

the population from all walks of working life and condemning them to a residual role. The world's universities need to tackle this situation from their local and global conditions and work to reappraise the sense and value of the knowledge and professions that they teach. Moreover, serious thought needs to be put into the meaning of an active life beyond identity-employment and the new forms of income, solidarity and justice that will be needed in the world that is being shaped right now.

- C44. Meanwhile, the present of the global university system is one of increasing and already structural instability of a large part of faculty, meaning both teaching and research staff. The realities of this instability are highly diverse depending on local contexts, but the trend is widespread and is conditioning long-term academic careers. In the field of the humanities, where sources of finance are more limited and there are fewer external resources, this situation is making it especially difficult to work beyond the short term and to make long-term plans. This is also severing intergenerational links and access by social classes that do not have resources of their own with which to get by in such insecure circumstances.

What ethics?

- C45. Universities cannot ignore the need to awaken ethical awareness among future citizens and professionals in every field. The most technical and scientific professions also have ethical implications that should not be ignored or delegated. Technologies themselves have consequences for ethical action and implications. Moreover, new technologies based on biomedical engineering, artificial intelligence, data science and biotechnology have immediate consequences, a high impact on everyday life and a scope that is hard to assess in real time. Ethics, therefore, must not be treated as a complementary subject but as a present and necessary condition throughout any kind of education.
- C46. In order to sustain an ethical view of any scientific or technological activity, that view needs to integrate human experience in all of its dimensions and place it in continuum with the natural world and the artificial universe. We are constantly making decisions that affect human beings and our links with other natural or artificial beings. This seems obvious today in such fields as medicine, which has reached extraordinarily high levels of patient depersonalisation and where there are urgent calls for new reflection on the human condition and on

life and death. But the same goes for other scientific activities, including the social sciences, where human behaviour ends up being reduced to disincarnate and non-implicated objects of study. There can be no ethics without context and decisions are never responsible if they do not deal with the consequences outside of their own delimited space.

C47. An ethical life also requires emotional implication. Universities have generally turned a deaf ear to the emotional lives of the communities around them, and all studies show that the most important ideas and decisions arise from highly specific emotional states. It is therefore important for academic activity to also be viewed as an activity that alters and transforms our emotions with epistemological but also ethical and political consequences for our surroundings.

The report has sought to inspire and guide debate on the present and future of the humanities and the synergies between the humanities, science and technology in the context of higher education in the world. It is based on the notion that we are at a crucial time of major global changes in which the world's education systems are confronted by a process whereby their roles in and contributions to society are being redefined, both locally and globally. The report, and these conclusions, should not be regarded as closed documents but, quite the contrary, as open documents that are expected to serve as a starting point for fostering urgent debate of its issues around the world, within each reality and each specific context.

Throughout these conclusions, a series of questions have been addressed and 48 main conclusions have been listed. This number is by no means definitive and readers will probably be able to draw other conclusions. The report has also fed on practical experiences and innovative initiatives from institutions, academics and practitioners around the world. We are well aware that each institution works in a given context, so we are not insisting that these experiences have to be adopted, out of respect for the richness of cultural diversity and contrasting ways of perceiving the world, but we do believe that they can serve as a source of critical analysis to inspire everyone with an interest in advancing towards an integrative concept of knowledge to work together to establish the synergies required for higher education to achieve its utmost humanising capacity.

Higher Education in the World 7

Humanities and Higher Education: Synergies between Science, Technology and Humanities

Higher Education in the World (HEIW) is a collective project that considers key issues and challenges facing higher education and its institutions worldwide.

Societies are witnessing profound changes with clear implications for the future; these environmental, scientific, technological, cultural and social transformations are presenting transcendental challenges in terms of thinking and rethinking the meaning and value of human experience, and even of what it means to be human. These challenges can only be tackled through a holistic approach involving the humanities, science and technology. Together, they must necessarily play their part as both drivers and critics within the framework of these transformations.

With contributions from 130 experts from around the world, the 7th Higher Education in the World Report *Humanities and Higher Education: Synergies between Science, Technology and Humanities* aims to provide the academic community, policymakers and decision-makers within higher education and wider society with a diagnosis and analysis of the current state of affairs, and offer proposals that can broaden our horizons towards a much needed integrated approach to knowledge.

Beyond protectionist nostalgia and catastrophism, the HEIW7 Report clearly advocates reappraisal and transformation, these being the two keywords that best describe the conceptual framework of the project. Far from being a speculative exercise, it addresses active members of the academic, cultural and institutional community around the world to find out what is happening, what changes they perceive, what their limits are and what their potentialities are. In summary, this report should be viewed as the open expression of a commitment shared by many different voices and as an open document that is expected to serve as a starting point for fostering urgent debate of its issues, within each reality and each specific context.

Complete open-content report available at:
www.guninetwork.org