



ICERI 2022

**15TH INTERNATIONAL CONFERENCE OF
EDUCATION,
RESEARCH AND
INNOVATION**



CONFERENCE PROCEEDINGS

7-9 NOVEMBER 2022
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Seville, Spain

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Preface

The ICERI2022 Conference Proceedings contain selected and revised papers from the 15th International Conference of Education, Research and Innovation.

ICERI2022 was held in Seville, Spain, from the 7th to the 9th of November 2022. ICERI is an annual event in which lecturers and researchers from 79 different countries gather to share valuable research and information about education, pedagogical technologies, and educational innovations.

Keynote speeches, networking activities, plenary sessions, parallel thematic sessions and workshops were, among some of the events on offer, delivered by world-leading educational experts at the conference, which provided participants the opportunity of global networking. The keynote speeches are available at IATED Talks (iated.org/talks/).

The scope of ICERI covered the following topics: Digital & Distance Learning, Digital Transformation of Education, Innovative Educational Technologies, Active and Student-Centered Learning, Assessment, Mentoring & Student Support, Educational Stages and Life-Long Learning, Quality & Impact of Education, Teacher Training and Educational Management, STEM Education, Discipline-Oriented Sessions, Language Learning and Teaching, Inclusion and Multiculturalism.

The ICERI2022 Proceedings include the accepted contributions presented at the ICERI2022 Conference. The ICERI2022 International Program Committee is composed of lecturers and researchers from all around the globe. A blind peer review process was followed in order to guarantee the quality of the final publication and during this process, the following points were evaluated: information content, relevance to the educational field, general structure, clarity of contents, originality, and relation to the conference topics and disciplines. The publication is solely in English.

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Finally, we wish to extend our most sincere thanks to all members and delegates who have contributed to these ICERI2022 Proceedings. We also wish to express our gratitude to all participants and attendees for their engagement, dedication and passion for education.

Luis Gómez Chova
Agustín López Martínez
Joanna Lees

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ICERI2022 Keynote Speakers

Keynote Speakers

Tracey Tokuhama-Espinosa – *Harvard University Extension School, United States*

Manu Kapur – *ETH Zurich, Switzerland*

Tracey Tokuhama-Espinosa – Harvard University Extension School (United States)



Keynote speech: What Every University Professor Should Know About Meaning Making

Over the years we have heard a lot about the important role of social-emotional learning within school settings. We have also learned something about how the brain learns in regular classrooms. What is less explored is how people make meaning out of their worlds by combining knowledge of how others feel and knowledge of how others think to construct reality. New neuroimaging technology now gives us a glimpse as to how people influence each other's learning through a dynamic exchange of cognition and emotion. Meaning Making is a term used to describe how humans give context to their

learning. In this keynote we will explain how humans learn from this perspective, and why and how higher education must shift to remain relevant in modern times.

Biography:

Tracey Tokuhama-Espinosa, Ph.D. is from Berkeley, California, is an alumna of the Harvard Graduate School of Education, and currently teaches a course at the Harvard University Extension School entitled The Neuroscience of Learning: An Introduction to Mind, Brain, Health, and Education Science. She is currently an educational researcher and serves as an Associate Editor of Nature Partner Journal Science of Learning and co-founder of Connections: The Learning Sciences Platform.

Tracey researches indicators to measure educational quality; learning in the digital age; transdisciplinary thinking; bilingualism and multilingualism; and the general improvement of teacher practices. Her most recent books are the Bringing the Neuroscience of Learning to Online Teaching: An Educator's Handbook (2021); Neuromyths: Debunking False Ideas About the Brain (2019); and The Five Pillars of the Mind: Redesigning Education to Fit the Brain (2019). She has authored articles for UNESCO and was a member of the Organisation for Economic Co-Operation and Development (OECD) expert panel to redefine teachers' new pedagogical knowledge in modern times.

Tracey's current focus is on understanding What Kids Want to Know About Their Own Brains, a book coming out with Columbia University's Teachers College Press next year. She is also writing a book called ThinkWrite: The Neuroscience of Writing, which explains why writing is the highest form of thinking. Finally, she is co-editing a new Handbook on Brain, Neuroscience and Education, which is a collection of work looking at the future of educational practice.

Tracey has lived and worked professionally in Tokyo, Geneva, Lima, and Boston, and is currently in New York and works with teachers, schools, governments, and NGOs in 40 different countries.

Manu Kapur – ETH Zurich (Switzerland)***Keynote speech: Productive Failure***

If learning from failure is intuitively compelling, how can we intentionally design for it, and bootstrap it for deep learning? In my talk, I will describe my research on Productive Failure, and its implications for how we design powerful learning environments, innovation and creativity.

Biography:

Manu holds the Professorship for Learning Sciences and Higher Education at ETH Zurich, Switzerland, and directs The Future Learning Initiative (FLI) at ETH Zurich. An ETH+ funded initiative, the FLI brings together more than 20 professors from 10 departments at ETH to advance research on the science of teaching and learning in higher education contexts, and translate it into the practice of teaching and learning at ETH Zurich.

Prior to this, Manu was a Professor of Psychological Studies at the Education University of Hong Kong. Manu also worked at the National Institute of Education (NIE/NTU) of Singapore as the Head of the Curriculum, Teaching and Learning Department, as well as the Head of the Learning Sciences Lab (LSL).

A mechanical engineer by bachelors training, Manu has always been passionate about mathematics. He taught college mathematics for four years, during which he was also the deputy leader for Singapore's team to the 43rd International Mathematical Olympiad in Glasgow. It was then that his intrigue for mathematical cognition took root, which led him to pursue a doctoral degree in the science of learning (specialization in instructional technology) at Columbia University in New York. Manu holds a double Masters: a Master of Science in Applied Statistics from Columbia University in New York, and a Master of Education from the NIE, Singapore.

As a learning scientist, Manu makes a commitment not only to advancing understanding of human learning, but doing so in ways that make an impact in the actual ecologies of learning. Drawing on his engineering mindset for design, Manu conceptualized and developed the theory of Productive Failure to design for and bootstrap failure for learning mathematics better. He has done extensive work in real-field ecologies of STEM classrooms to transform teaching and learning using his theory of productive failure across a range of schools and universities in around the world.

His research on Productive Failure has been taken up by the Singapore's Ministry of Education for wide-scale re-design and implementation of its pre-university mathematics (statistics) curriculum and pedagogy.

Conference Tracks & Sessions

The ICERI2022 conference program is available online at <https://iased.org/iceri2022>

ORAL SESSIONS MONDAY

Virtual & Augmented Reality
Tutoring & Coaching
Entrepreneurship Education (1)
Robotics in Education
Flipped Learning
Best Practices in Maths Education
Students and Teachers Wellbeing
Exchange & Mobility Programmes
Technology Enhanced Learning
Rethinking Assessment in COVID-19 Times
University-Industry Collaboration (1)
Responsible Research and Innovation in STEM
Gender Issues in Education
Trends in Maths Education
Special Education (1)
New Technologies in Language Learning
Design Thinking
e-Assessment
Employability Trends and Challenges
Architecture Education Experiences
Pedagogical Innovations
Computer Science and Programming in Higher Education
Inclusion of Learners with Special Educational Needs
Teaching and Learning Foreign Languages
21st Century skills
Assessment & Feedback
Entrepreneurship Education (2)
Engineering Education
Project and Problem Based Learning
Coding at Schools
Special Education (2)
Second Language Learning & Bilingual Education

POSTER SESSIONS MONDAY

Pedagogical Experiences in Teaching and Learning
Emerging Technologies and Distance Learning

ORAL SESSIONS TUESDAY

Digital Transformation of Education
From Face-to-Face to Remote Learning
Universal Design for Learning & Learning Space Design
Media & Information Literacy
Blended and Hybrid/Hyflex Education
Professional Development of STEM Teachers
Educational Leadership and Management
Students Wellbeing during and after COVID-19
Online Teaching and Learning
Lessons learned from the COVID-19 pandemic

Student Support
 Diversity Issues & Inclusive Education
 Active & Experiential Learning
 Professional Development of Teachers (1)
 International Experiences
 Remote and Virtual Laboratories
 e-Learning
 Quality Assurance & Learning Analytics
 Inclusion & Multiculturalism
 Student Engagement and Motivation
 Service Learning & Community Engagement
 ICT Skills among Teachers
 How to better match the language proficiency needs? The Kielibuusti project
 Cooperative & Problem Based Learning in Computer Science
 Research on Educational Technologies
 University-Industry Collaboration (2)
 Educational Software
 Digital Literacy
 Gamification & Game-based Learning
 Pre-Service Teacher Education
 How to Build an Entrepreneurship Education System across Educational Levels?
 STEM Experiences
 Social Media in Education
 Workplace & Vocational Training
 Curriculum Design Experiences
 Engagement and Motivation during COVID-19 Pandemic
 Sustainable Development Goals in Education
 Professional Development of Teachers (2)
 Educational Management
 Health Sciences Education

POSTER SESSIONS TUESDAY

Innovations and Quality in Education
 New Trends in Education and Research

VIRTUAL SESSIONS

DIGITAL TRANSFORMATION OF EDUCATION

Data Science & AI in Education
 Learning Analytics & Educational Data Mining
 Digital Technologies and Resources for Learning under Lockdown
 Digital Transformation
 21st Century Skills
 Educational Programming & Robotics

DIGITAL & DISTANCE LEARNING

Distance Education in COVID-19 Times
 MOOCs & Open Educational Resources
 Blended & Mobile Learning
 e-Learning Experiences
 Learning Management Systems & Virtual Learning Environments
 Post-Pandemic Scenarios in Education

INNOVATIVE EDUCATIONAL TECHNOLOGIES

AI, Chatbots & Robots
 Virtual & Augmented Reality
 Social Media in Education
 Technology Enhanced Learning

TEACHER TRAINING & ED. MANAGEMENT

ICT & Digital Skills
Professional Development of Teachers
Educational Management

ACTIVE & STUDENT-CENTERED LEARNING

Gamification & Game-based Learning
Active & Experiential Learning
Problem & Project-Based Learning
Developing Soft and Transversal Skills
Pedagogical Innovations

ASSESSMENT, MENTORING & STUDENT SUPPORT

Assessment & Evaluation
Rethinking Assessment in COVID-19 Times
Mentoring & Tutoring
Student Support & Motivation
Student Engagement & Wellbeing in COVID-19 Times

EDUCATIONAL STAGES & LIFE-LONG LEARNING

From Pre-school to Secondary Education
Vocational Training
Transition to the Job Market
Developing Entrepreneurship in Education
Life-Long & Workplace Learning
Libraries and Museums as Learning Spaces

QUALITY & IMPACT OF EDUCATION

Quality in Education
Experiences and Challenges in Curriculum Design
Sustainability & Environmental Awareness
Social Impact of Education
University-Industry Collaboration
Education and Research

MULTICULTURALITY & INCLUSION

Multicultural Education
Diversity Issues
Special Educational Needs
Inclusive Education

STEM EDUCATION

Mathematics & Statistics
Engineering Education
STEM Experiences
Computer Science Education

LANGUAGE LEARNING AND TEACHING

Foreign Languages
New Technologies in Language Learning
Language Learning & Translation Studies

DISCIPLINE-ORIENTED SESSIONS

Architecture & Interior Design
Health Sciences Education
Business and Marketing Education
Military Education