### Bibliographic Information

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<tr>
<th>Book Title</th>
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<th>Editors</th>
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<tr>
<td>ICERI2022</td>
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More information about the publication ethics of IATED is available at iated.org/publication_ethics
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 Multiculturality.

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.

Moreover, ICERI aims to publish conference proceedings that contain high-quality original research articles, meeting the expected ethical standards. All authors that published their papers in the ICERI2022 Proceedings signed the IATED copyright transfer form. IATED guarantees the high technical and professional quality of the publications, and that good practice and ethical standards are maintained. More information about the publication ethics of IATED is available at: https://iated.org/publication_ethics.

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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Wendy Gorton – Educational consultant, United States
ICERI2022 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://iated.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 & Multiculturality  
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
STÉM 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