iLRN 2024 Preface

The 10th annual International Conference of the Immersive Learning Research Network (iLRN2024) continued to push the boundaries of immersive learning, offering a hybrid experience that combined a virtual campus experience on the iLRN Virtual Campus (powered by ©FrameVR) and CVent meetings in June, followed by on-location events at the University of Glasgow and the University of St. Andrews, in Scotland. This year's conference brought together an international community of scholars, practitioners, and innovators to explore the theme of *Tech4Good!*

Submissions at this year's iLRN conference truly leverage the idea of using tech for good: The iLRN community's mission is reflected in diverse focus areas that drive positive educational and societal change. Learning innovation and educational technologies enhance personalized learning while upholding ethics and privacy. Inclusive design, educational equity, and digital inclusion ensure access for all. Ubiquitous learning and digital twins create immersive environments, and our emphasis on health, wellbeing, and climate change education prepares learners for a sustainable future. Through museums, libraries, heritage education, and community engagement, we support lifelong learning. Special education, K-12 STEM, language learning, and workforce training address diverse needs, while data analytics and assessment drive continuous improvement. By integrating these domains, iLRN embodies "Tech for Good," fostering meaningful educational and societal impacts.

Building on the success of our past conferences, iLRN2024 showcased cutting-edge research that explored the transformative potential of immersive learning to create more inclusive, engaging, and effective learning experiences for diverse populations. The conference also provided a platform for attendees to network, connect, and contribute to the growing area of immersive learning. In addition, iLRN2024 keynote and featured speakers represented a diverse range of backgrounds and perspectives, including experts worldwide, contributing to the discussion of applications of Immersive Learning in different domains.

In keeping with our commitment to innovation and inclusion, iLRN2024 featured a range of exciting events, including Guided Virtual Adventures, iLRNFuser Game Jams. We hosted thirteen academic tracks, including three special tracks: Immersive Learning across Latin America, which explored state-of-the-art research, use cases and projects specifically for the Latin America region; Sustainable Development and Immersive Learning in the Climate Emergency; and Literacy Equity and Immersive Learning.

473 authors from 38 countries submitted publications to the Academic and iLEAD (immersive Learning Education and Design) tracks. Countries included Albania, Australia, Austria, Belgium, Brazil, Canada, China, Colombia, Estonia, Finland, France, Germany, Greece, Honduras, Hong Kong, India, Ireland, Italy, Japan, The Democratic People's Republic of Korea, Latvia, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Philippines, Portugal, South Korea, Spain, Sweden, Switzerland, Tanzania, Turkey, Ukraine, United Kingdom, and United States.

144 submissions in total were received for the Academic track, 129 of which were submitted for publication. These include full and short papers, work-in-progress (WiP) poster papers and submissions to the Doctoral Colloquium (DC). Every submission underwent a rigorous review by at least three members of the Program Committee to maintain high scientific and quality standards, including meta-reviews for each full and short paper All contributions were evaluated in a double-blind review process and checked for plagiarism to ensure authors submitted original work. After the peer-review process, all authors were given meaningful feedback on their submissions, and promising work was invited to resubmit in a different category when reviewers agreed that papers needed substantial work (i.e. full papers were invited to resubmit as short papers and short papers as WiP posters).

In addition, we are proud to present our second iLEAD Proceedings volume, showcasing 35 accepted submissions presented at the conference. All contributions were evaluated in a double-blind review process and checked for plagiarism to ensure authors submitted original work. After the peer-review process, all authors were given meaningful feedback on their submissions. They include a range of contributions, including 23 oral presentations, 5 posters, 1 demonstration, 1 symposium, 1 panel, and 4 workshops. Authors submitted extended abstracts with well-articulated and insightful perspectives on the applications of immersive learning education and design.

All iLEAD papers, WiP poster papers, and DC papers were published with an individual DOI in the iLRN online proceedings. The iLEAD papers were reviewed according to four criteria: 1) contribution to immersive learning education and design, 2) clarity and writing style, 3) instructional or learning design, 4) conclusions, impact, or recommendations. We hope these publications will be a valuable resource for scholars, practitioners, and researchers in immersive learning and inspire future discoveries and innovations in our exciting and rapidly evolving field.

We celebrated outstanding contributions through our *Best Academic Paper* awards (with awards for each category, including student papers). The Program Chairs chose final nominees from those that received the best reviews and have been nominated for awards by reviewers. The winners were selected by an independent jury panel, which was asked to review the nominated papers based on contribution, methodology, and clarity. The iLEAD awards included *Outstanding Contribution to Pedagogy, Innovation in K-12 Education, Innovation in Higher Education, Best Poster, and Outstanding Workshop*.

Reviewers provided feedback on submitted papers, suggested improvements, and recommended to the Program Chairs whether to accept, reject or request paper changes. Reviewing is a volunteer and time-intensive process, and we are grateful to all our reviewers for contributing to our community. We implemented the *Best Academic Reviewer* award as a small way to recognize them for their service. An independent jury panel chose the winning reviews. The jury panel made a meta-review of the nominated reviews based on the study's rigor, contribution to improving a paper and developing the conference.

In addition, we recognized the service our conference organizing committee does, volunteering their time to make this event happen. We acknowledge their contribution via the Service awards. The list of winners is available in the *Awards* section of this volume. We sincerely thank those involved who volunteered their time

to make this such a great event and attendees for joining us and sharing their excellent work with the iLRN community.

If you are not already involved, we invite you to read these proceedings and join us in our subsequent events and ongoing initiatives.

iLRN 2024 General Chairs	**iLRN 2024 Program Chairs, iLEAD Stream**
Andreas Dengel, *Goethe University Frankfurt*	Paula MacDowell, *University of Saskatchewan,*
Marie-Luce Bourguet, *Queen Mary University of London*	Jewoong Moon, *University of Alabama*
Rami Ghannam, *University of Glasgow*	Douglas Wilson, *George Mason University*
Alan Miller, *University of Saint Andrews*	

About iLRN Conference Series

iLRN's annual conference is the premier scholarly event focusing on advances in the use of virtual reality (VR), augmented reality (AR), mixed reality (MR), and other extended reality (XR) technologies to support learners across the entire span of learning—from K-12 through higher education to work-based, informal, and lifelong learning contexts.

iLRN's annual conference, indexed with CORE ranking C (http://portal.core.edu.au/conf-ranks/2266/), is the most relevant conference in Immersive Learning, devoting the entire conference to this topic.

iLRN has hosted hybrid conferences in San Luis Obispo (2023) and in Vienna (2022), two entirely online and in-VR conferences in 2021 and 2020, and in-person editions in London, UK (2019), Missoula, Montana, USA (2018), Coimbra, Portugal (2017), Santa Barbara, California, USA (2016), and Prague, Czech Republic (2015).

Contact

- Inquiries regarding the iLRN 2024 conference should be directed to the Conference Secretariat at conference@immersivelrn.org
- Inquiries regarding these proceedings should be sent to publications@immersivelrn.org
- General inquiries about iLRN may be sent to info@immersivelrn.org

iLEAD 2024 Conference Program

iLEAD 2024 Papers	
Kitty Zhuang, Lucas Li, Irene Humer, Christian Eckhardt	Project Shoot: Effects of the Virtual Learning Environment on Archery Training
Nicola Fern, Alexandra I. Cristea, Sam Nolan, Craig Stewart	How Interactivity and Presence Affect Learning in Immersive Virtual Reality: A Mixed Methods Study Design
Matthias Conrad, David Kablitz	Virtual Reality and Learners' Cognitive Activation: Findings from an Exploratory Study with Retail Apprentices
Jule M. Krüger, Steffen Ramm	Conceptualizing and Developing an AR-enriched Workshop for Teaching School Children in a Botanical Garden
Jane Harrington and Ian Holyoak	MedMicroMaps: An Immersive Experience for Infectious Diseases and Medical Microbiology Diagnostics
Divine Osanapa, Shahaan Ahmed, Mohammed Shikdar, Jack Ingram, Stephen Selwood, Markos Mentzelopoulos, Kai Erenli, Shaif Hemraj	Game-based Learning Mars EcoVenture: Rover's Odyssey
Jessi Kittel	Immersive Classrooms: A Faculty-Centric Inquiry into XR Adoption
Genevieve Smith-Nunes, Alex Shaw	A Journey into Space-tial Computing: Trials and Tribulations of an Episodic AR ballet
Zilong Pan, Robson Araujo-Junior, Alec Bodzin, Thomas Hammond, David Anastasio, Na Chen, Luke Wong, Brandon Yee, Papa Asibuo	Optimizing Desktop VR for Immersive Experiences Through User-Centered Design Approach
Oliver Guy, Katharina Hellmich, Leonard Rexha, Jakob Tüchler, Lewis Vaillant-Jones, Markos Mentzelopoulos, Kai Erenli, Maximilian Mayerl, Jonathon Richter, Jack Ingram, Stephen Selwood, Christopher Kronenberg	Generating Educational Content to Assist Climate Change Awareness
Meryem Yilmaz Soylu, Lina Kim, Jeonghyun Lee	Insights into College Students' Experiences and Expectations for VR Integration in Education
Vanesa Mendez, Ines Lobo, Yoanna Gramatikova, Fanny Mozes, Stefan Krotenthaler, Aristidis	Enhancing Learning through AI: An Approach to Ocean Conservation and Recycling Education

Protopsaltis, Markos Mentzelopoulos, Kai Erenli, Daphne Economou	
Yeil Jeong, Yunseo Lee, Gyuri Byun, Jewoong Moon	Navigating the Creation of Immersive Learning Environments in Roblox: Integrating Generative AI for Enhanced Simulation-based Learning
Hrishikesh Mulay, Sam Redfern, Eleni Mangina	Automated Lip Reading: Exploring the potential for Accessibility Measures in XR
	Unlocking Achievements: The ACATAR Path to Personalized Learning
Daniela R Bicalho, João Piedade, J.F. Matos	Reflections on the Technological and Immersive Elements in Educational Practices in Virtual Reality
Julie Fogt, Sara Heintzelman	Social and Emotional Learning through Immersive Experiences for Students with Disabilities
Lavinia Hirsu, Julie McAdam	Tapping into Designers' Creative Process of Immersive Narratives
Alec Bodzin, Robson Araujo-Junior, Thomas Hammond, Zilong Pan, David Anastasio, Jonah Burd, Kavya Jhaveri, Quan Le	Designing for Headset VR from a Longer Desktop VR Learning Experience: Watershed Explorers Industrial History
Jeffrey Price, Hamida Khatri, Bryon Caldwell, Justin Shaw, Brandon Coffey, Scott Krabbenhoft	Virtual Recreation in Augmented Reality for Artistic Expression and Exhibition
Victoria Lowell, Kevin Jones	Teachers' Technology Acceptance and Perceptions of Augmented Reality (AR) Instructional Content and Curriculum Resources for Engaging Science Students in Taxonomy and Classification Through AR-Technology-Assisted Learning
Nicole Harder, Kimberly Workum	Shaping the Future of Healthcare: The University of Manitoba's Virtual Reality Interprofessional Education (VR-IPE) Program
Jasmin Cowin, Jasmin Cowin	AI-Supported Simulation Training: Redefining Teacher Preparation
Lisa Dawley	The Design of Culturally Relevant Immersive Environments and Learning Activities

Yameng Cui, Robson Araujo-Junior, Alec Bodzin	Creating an Immersive Wayfinding VR Experience Using Design Thinking and Uptale
Eunhae Kim	Cultivating Digital Talents Using Realistic Educational Content in Korea
Gyuri Byun, Jewoong Moon, Chen Sun	Enhancing Computational Thinking through Constructionist Gaming in a Roblox-supported Virtual Makerspace
Xiangyu Hu, Jiayan Zhu, Robson Araujo-Junior, Tarah Cicero, Alec Bodzin, Thomas Hammond, David Anastasio, Zilong Pan and Chad Schwartz	Mystery of Lehigh Gap: Interaction and Dialogue Systems
Kai Erenli	Unlocking Achievements: The ACATAR Path to Personalized Learning
Mikhail Fominykh, Ekaterina Prasolova-Forland	Supporting Career Guidance and Vocational Training in Fishery and Maritime Professions with Virtual Reality

iLEAD 2024 Panel & Symposium

Judy Jaunzems-Fernuk, Cynthie Gaetz, Amanda McArthur, Paula MacDowell	Immersive Education in Practice: Pedagogical Considerations for Designing Deep and Meaningful Immersive Learning Experiences
Victoria Lowell, Paula MacDowell, Victoria Abramenka-Lachheb, Marie-Luce Bourguet, Todd Cherner, Sean Kao, Tony Liao, Sarune Savickaite, Matthew Schmidt, Kristin Torrence, Quincy Wang	Symposium on Design Considerations for Authentic Learning in Extended Reality (XR) Environments and Experiences

iLEAD 2024 Workshops

Leonel Morgado, Dennis Beck	Authoring a Personal GPT for Your Research and Practice: How We Created the QUAL-E Immersive Learning Thematic Analysis Helper
Eric Chamberlin	Making the Leap to Immersive learning: Leveraging WebXR to Transition from Web 2.0 to Web 3.0
Thayná Bertholini	Engagement in Online Synchronous Workshops: Fostering Interaction by Leveraging Breakout Rooms
Andreas Dengel, Alexander Steinmaurer	IEEE TC-ILE Workshop: Bridging Extended Reality and Artificial Intelligence in Immersive Learning