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Esperienze, strumenti e ambienti per la didattica immersiva

Experiences, tools, and environments for immersive teaching

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«As soon as the mechanical walkway retracted, we were at sea. We could observe the waves and the coastline from the glass windows and feel the boat rolling gently under our feet. We set direction and powered the engines; we were sailing smoothly, a few snowflakes whirling in the wind. As we were passing under a great bridge, however, the person in command turned the helm awkwardly and the boat was suddenly facing one of the bridge foundation pillars. Despite a last-second attempt at avoiding the collision, it was too late – our boat hit the concrete basement of the pillar, tilting dangerously, and sent us grasping for any surface that could stop us from falling. It was a true disaster – however, none of it was real. As the lights in the room switched back on, we could read on each other's faces a mix of amazement and uneasiness – while we were aware of being in a simulator, the feeling of "being there" was powerful. We were standing inside the boat simulator at the Arctic University of Trømso, a 360-degree room-wide simulator, complete with mechanical feedback, where ocean leadership students cut their teeth before taking their final exam at sea».

This is an example of what we call "immersive learning". It can be defined as an advanced form of active learning, where the learner's direct experience is the touchstone from which meaningful learning is developed (Motley, 2021). All learning starts from probing the world around us, using what knowledge we already possess to make sense of what we perceive, in a looping cycle that in turn can change the way we represent and interpret the world, acquiring new knowledge, skills, and attitudes. As such, the term "immersive" can describe any activity in which the learner can interact with the environment with at least some degree of agency and temporal continuity, such as periods of study abroad, internships, on-field research, games, and role-play activities. Currently, however, it mostly refers to learning experiences mediated by digital tools, with the adjective "immersive" referring to the degree to which the digital system simulates the environment (Moore, 2020). In a *continuum* between the entirely physical world to the fully virtual environment, digital technology can superpose elements to the world (Augmented Reality, or AR), substitute the real with a simulated world to explore and interact with (Virtual Reality, or VR), or provide a persistent digital environment where our digital avatars can meet and interact (metaverses).

What happens, then, when what our senses perceive is not our everyday world but a simulated reality? Can this technology be leveraged to provide significant

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learning experiences and promote meaningful learning? What are the skills required to put this technology to good use, both from the teacher's and the learners' side? And is the investment, both in terms of money and training required, worth it?

Those are some of the questions that this volume addresses.

As with any new technology with the potential to change the way we perceive and think about the world, our reaction may vary from an "apocalyptic" to an "integrated" view, borrowing the terms that Umberto Eco (1964) famously coined. Understanding and making good use of a new technology, however, requires way more than that: it requires critical reflection, empirical evidence, and a plurality of relevant opinions. This is the goal of this volume: to go beyond the superficial fascination towards new technology, often driven, as is the case of the metaverse, by commercial interest, and towards the acquisition of a critical bigger picture (Buckingham, 2021) that takes into consideration philosophical, ethical, psychological, pedagogical, and instructional perspectives. As the world is taken by storm by increasingly powerful tools able to simulate reality, including so-called artificial intelligence, maintaining an open and critical approach is ever more important. Immersive technologies promise reduction of traveling costs, spaces, and equipment for training; prevent real-life consequences when training for dangerous or risky tasks, as our little boat trip exemplified; allow new forms of data collection and assessment, through integration with learning analytics, and promote vivid scenario- and storytelling- based learning experiences (Buchner & Andujar, 2019; Hand et al., 2016; Scoresby & Shelton, 2011). Putting this potential to good use, however, also means understanding limitations and appreciating that any innovation must be foremost supported by a change in the way we think (Hand et al., 2016; Alam, 2021; De Freitas et al., 2010).

This volume of IUL Research hosts five research papers.

In the first article, Andrea Nardi and M. Elisabetta Cigognini investigate the students' perceptions following a large experimental teaching and learning activity during the COVID pandemic with Minecraft, possibly the first videogame game capable of penetrating Italian schools. Their results show not only that this instrument can be effective also in distance learning scenarios, but also that the social dynamics among students vary accordingly and need to be considered.

In the second article, Alberto Fornasari, Paola Lisimberti, and Rosa Minerva investigate the media habits of future special ed teachers and report that there is still a lot of disparity between a general acceptance towards the potential of digital technology for different learning tasks and actual expertise with digital, and especially VR, tools.

Angelos Sofianidis, Luciana Oliveira, Nayia Stylianidou, Maria Meletiou-Mavrotheris, Evangelia Parisopoulou, Ella-Maria Lukala, Clara Sarmento, and Panagiotis Giannakoudakis explore the perceptions of primary and secondary teachers on piloting an Augmented Assessment Approach that employs visual representations with newly arrived migrant students. They discuss emerging

challenges and opportunities that could lead towards a more inclusive assessment in Science and Mathematics disciplines.

Elena Mosa, Andrea Benassi, and Silvia Panzavolta present the preliminary findings of a pilot study where VR technology has been used as a setting for a virtual debate activity for school students and discuss the early returns obtained through a mixed-method approach.

Federica Cavaletti and Ilaria Terrenghi present a comparative study that well exemplifies the complexity of designing activities using immersive technology; they investigate the effectiveness of preparatory activities using either VR or traditional pen and paper tools towards the fruition of an art exhibit in VR; they conclude that the preparatory materials used are just as, if not more, important as the way in which they are presented.

Two systematic reviews of the literature are also part of this issue.

In the first review, Annamaria Cacchione focuses on the metaverse as a new dimension of e-learning, focusing on its defining aspects: multimodality, personal identity, and the intersection between the simulated and the real world, providing a useful compass to navigate this still uncertain field.

In the second review, Federica Doronzo, Giuliana Nardacchione, and Ester Di Muro focus on a specific application of VR technology; namely, its use in promoting rehabilitation/habilitation processes through the stimulation of brain plasticity mechanisms. They discuss its use in stroke rehabilitation, suggesting that this technology might be useful both during and after critical windows that occur shortly after the attack.

This volume includes reflection papers, that address this multifaceted topic from different perspective.

Marilena di Padova discusses current experiences and best practices in an emerging field of application, that of immersive technologies in healthcare instruction, and advocates for the need of a responsibility pact between the student, the family, the school, and the healthcare institution.

Martina Rossi, Michele Ciletti, Alessia Scarinci, and Giusi Antonia Toto address the topic of the metaverse, adopting a historical perspective on its different incarnations and discussing the ways in which it can impact interactions between the teacher and the learner.

Tiziano Manna discusses immersive technologies as a kind of experiential learning, and within this context he focuses on constructs such as attention, interaction, and cognitive load, as well as on the role of different instructional processes to promote learning.

Francesca Finestrone, Pierpaolo Limone, and Guendalina Peconio provide a horizontal perspective on national and international experiences of using VR technology at the school level, discussing them considering the construct of sociality and the theory of cognitive load.

Delio De Martino and Maria Clara Dicataldo provide a historical analysis of the concept of “immersivity” and its association with learning, taking us to a trip from Plato’s cave to the current representation of the metaverse, and discuss the debate on risks and opportunities of emerging technologies within this perspective.

Pasquale Gallo discusses the digital revolution through the lens of emotion: in particular, how our life, increasingly conducted online, impacts and shapes our emotional intelligence.

Francesca Scasciamacchia guides us to the metaverse, discussing it in terms of gamification and its potential to develop soft skills from an instructional perspective.

Veronica Beatini, Alessio Di Paolo, Michele Todino, and Stefano Di Tore discuss the relationship between perception, emotions, avatars, and how VR can impact the development of executive functions, focusing on creative inhibition, identifying potential drawbacks and opportunities for how this technology can be used in education.

Manuela Cantoia proposes a novel instructional model for the design of game-based learning activities, drawing on Kolb’s experiential learning framework to develop modular learning units that promote critical reflection-driven learning.

Giuseppe De Simone, Simon Kidiamboko, and Michele Domenico Todino provide a focus on innovative teaching methodologies and media education in African countries, discussing the development of robotics as a tool to promote entrepreneurship in Congo.

As important to critical and informed perspective are the reports of immersive learning experiences that teachers and researchers have realized in different environments, from primary schools to higher education.

Mario Giampaolo and Caterina Garofano present the realization of the first 360-degree video part of the project “Inside a Working Place”, and the results of a survey that investigated perception of immersion and efficacy within participants who experienced the video.

Emma Abbate presents a learning activity part of a European project where students employed VR to visit and examine the scientific instruments in a simulated version of a real biology laboratory, and to experience how in-vitro stem cell experimentation can be used as an alternative to animal experimentation.

Calogero Sorce reports a teaching experience in which high school students realized short TikTok videos on the life of past and contemporary historical figures, sometimes impersonating them, to develop media literacy competencies.

In the activity reported by Manlio Piva, elementary school children experienced the paintings of the Russian artist Wassily Kandinsky through virtual tours, before trying their hand at the creation of a virtual exhibition of their own artworks, inspired by the painter's aesthetic theories.

Giuseppe Filippo Dettori and Barbara Letteri focus on the theme of inclusiveness in immersive learning, presenting an experience that took place in a secondary school in Sardinia where several students with special educational needs (BES) were subjected to immersive learning activities during the COVID-19 pandemic.

Rosa Iaquinta has explored in this report how on-field immersion and digital tools can be used in a synergic manner to discuss fragility, in this case linked to the conflictual relationship of students with their problematic environment, characterized by poverty, migration, and unemployment.

Finally, to build on the need to integrate multiple perspectives and informed reflections, this volume also includes four book reviews.

Sabrina Annoscia reviews the book "Insegnare e apprendere in aula e in rete per una didattica blended efficace" by Giovanni Bonaiuti and Anna Dipace.

Angelo Basta reviews "Dal metaverso alla stampa 3D. Prospettive semplesse della didattica innovativa" by Stefano Di Tore.

Lucia Campitiello reviews "Metaverso e realtà dell'educazione", a volume curated by Salvatore Colazzo and Roberto Maragliano.

Delio De Martino reviews "Etica dell'intelligenza artificiale. Sviluppi, opportunità, sfide" by Luciano Floridi.

To conclude where we started, on a (virtual) boat, our hope for the reader is that this volume of IUL Research provides a useful compass to navigate the tantalizing, and still largely unexplored, waters of immersive technologies and their applications in education.

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