Italian Journal of Educational Technology

itd
ISTITUTO TECNOLOGIE DIDATTICHE

Editorial. Extended education as an interconnected ecosystem

Editoriale. Educazione estesa come un sistema interconnesso

BARBARA BRUSCHI[A], LAURENT DUTOIT[B], IOANNIS LEFKOS[C], MANUELA REPETTO[A*]

[A] *University of Turin, Italy, barbara.bruschi@unito.it, manuela.repetto@unito.it**

[B] *HES-SO University of Applied Sciences and Arts Western Switzerland, Switzerland, laurent.dutoit@hes-so.ch*

[C] *University of Macedonia, Greece, lefkos@uom.edu.gr*

* Corresponding author

Extended Education is increasingly evolving into a structured and interconnected ecosystem (Arias et al., 2025) in which technological innovation, pedagogical intentionality, and social responsibility converge. If the previous issue framed Extended Education within a technology-augmented world, this issue interrogates how such an expanded educational landscape can become inclusive, sustainable, and cognitively transformative.

The contributions collected in this issue highlight a decisive shift: from technological possibility to pedagogical responsibility. Digital tools—Artificial Intelligence (AI), Augmented Reality (AR), Virtual Reality (VR), and audio-based media such as podcasts—are not presented as ends in themselves, but as mediating infrastructures capable of reshaping access, participation, and professional practice. In this sense, Extended Education emerges not simply as a spatial or temporal extension of learning, but as a qualitative transformation of educational experience.

A first key dimension concerns geographical and cultural extension. The systematic review by Garib et al. on Project-Based Language Learning (PBLL) in the Middle East and North Africa (MENA) region broadens the global perspective on Extended Education. By mapping over four decades of empirical research, the study reveals how PBLL enhances engagement, critical thinking, and language acquisition across diverse educational contexts, despite infrastructural and curricular constraints. Particularly significant is the role attributed to teacher professional development and technological availability: innovation does not spread automatically but requires systemic investment in educator competence and institutional support. Extended Education, therefore, is not simply about adopting methods; it is about enabling conditions for their meaningful implementation.

A second dimension relates to inclusion and accessibility as structural principles. The contribution by Del Bianco et al. situates Extended Education within the framework of cultural rights and social participation. Through the integration of AR, VR, and AI in museum environments, their project demonstrates how digital technologies can enhance accessibility for individuals with intellectual disabilities and autism. Museums become inclusive learning spaces, where immersive and adaptive tools facilitate participation and well-being. Here, Extended Education expands beyond formal schooling and affirms itself as a lifelong and life-wide process, deeply connected to citizenship, equity, and human dignity.

In parallel, Pecoraro's study on educational podcasts in teacher training underscores the strategic importance of preparing future support teachers to use digital tools critically and effectively. The structured evaluation of podcast creation applications and their pedagogical integration reveal that technological innovation must be accompanied by methodological rigor. Podcasts, often perceived as simple media tools, are reframed as instruments for fostering inclusion and personalized learning pathways. Extended Education thus depends not only on advanced technologies but also on the professional agency of teachers capable of selecting, evaluating, and adapting tools to diverse learner needs.

The cognitive implications of technology integration are further explored by Lembo et al., whose six-month intervention in primary education examines the impact of Augmented Reality on memory processes. Their findings—showing improvements in content acquisition, visuospatial memory, and semantic memory—suggest that AR can meaningfully support cognitive encoding and retrieval even at early developmental stages. Importantly, the intervention was not designed as formal cognitive training, yet it produced measurable effects on memory-related functions. This contribution invites us to consider Extended Education not only as expanded access but also as enhanced cognitive architecture: technologies can scaffold mental processes when embedded in coherent pedagogical design.

Finally, Paludo's study addresses one of the most debated terrains of contemporary education: generative AI in programming and computer science learning. Rather than framing AI as a threat to academic integrity, the research proposes a metacognitive paradigm in which AI-generated code becomes a catalyst for reflection, creativity, and higher-order thinking. The reported improvements in AI literacy and metacognitive awareness among students indicate that the question is no longer whether AI should be present in educational contexts, but how it can be orchestrated to cultivate critical competencies. Extended Education, in this perspective, requires a shift from tool control to cognitive regulation—where learners develop the ability to supervise, interpret, and critically evaluate AI outputs.

Across these diverse contexts—language education in MENA, inclusive museum environments, teacher training, primary education, and programming—common threads emerge.

First, teacher professionalism is central. Professional development, methodological competence, and evaluative capacity are consistently identified as preconditions for effective innovation.

Second, accessibility is not peripheral but foundational. Whether addressing disability, geographical disparities, or technological gaps, Extended Education must be anchored in equitable design.

Third, cognitive and metacognitive development represents a crucial horizon. Technologies become transformative when they strengthen critical thinking, memory processes, creativity, and reflective judgment.

This issue thus reframes Extended Education as an interconnected and inclusive ecosystem—one that integrates technologies within pedagogical intentionality, institutional support, and ethical awareness. The augmented world is no longer an emerging scenario; it is

an operational reality. The challenge ahead lies in ensuring that this reality remains human-centred, cognitively meaningful, and socially equitable.

1. References

Arias, J., Salas, J. I., Chiappe, A., & Sáez Delgado, F. (2025). The Extended Education 4.0: Lifelong Learning in Times of Artificial Intelligence. *Applied Sciences, 15*(17), 9352.