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Editorial: Artificial Intelligence and emerging technologies for inclusive and innovative education

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Editorial on the Research Topic

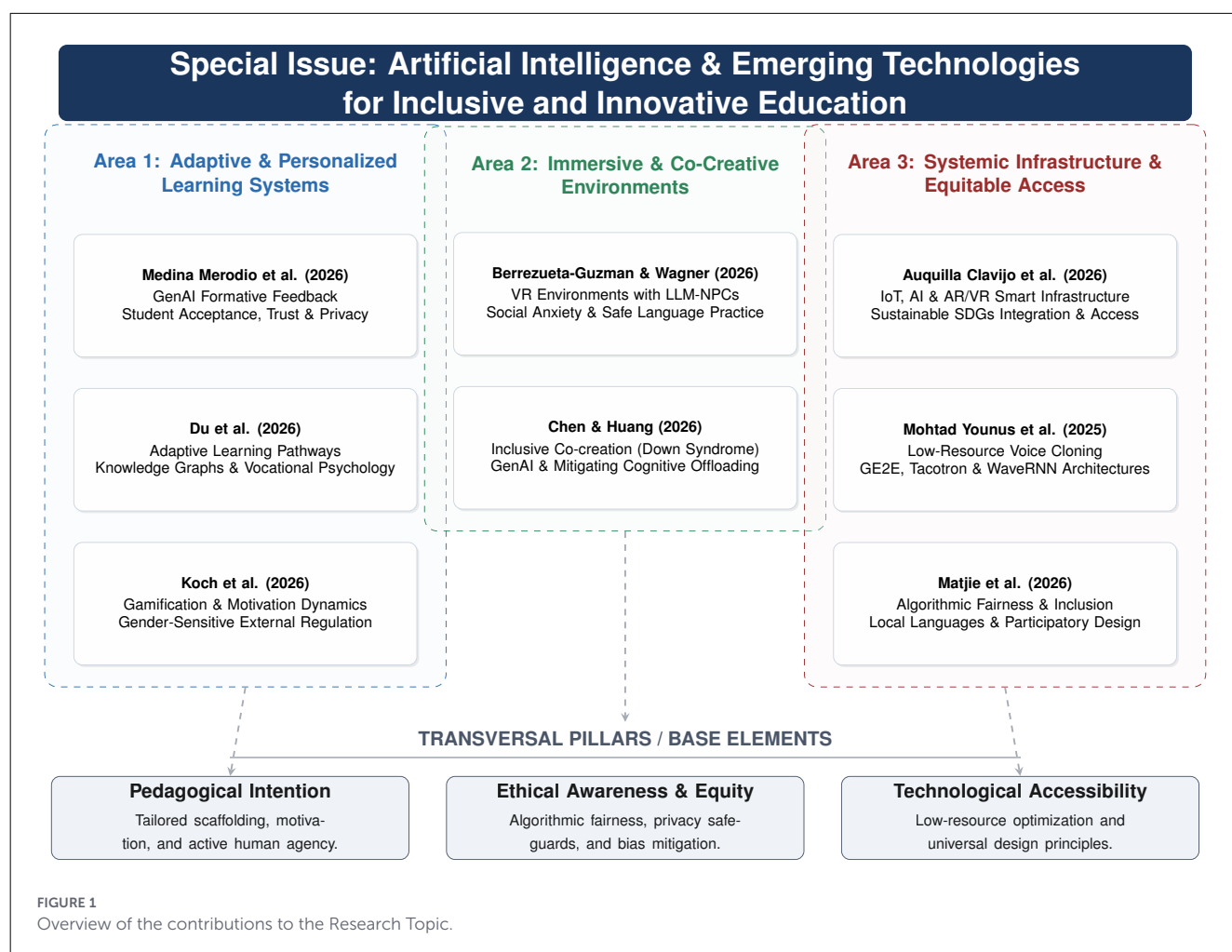
Artificial Intelligence and emerging technologies for inclusive and innovative education

1 Context and objectives

The integration of Artificial Intelligence (AI) and emerging technologies is restructuring the foundations of educational paradigms worldwide. In recent years, significant developments such as the widespread availability of Large Language Models (LLMs), the expansion of generative tools for content creation, and the maturation of advanced learning analytics systems have reconfigured didactic interaction. These advancements have begun to shift the educational axis from standardized instructional models toward real-time, interactive, and personalized assistance environments. In this context, this Research Topic explores how these tools are not only highly useful for optimizing academic performance but also capable of fostering truly inclusive, equitable, and sustainable learning environments.

By reviewing previous research, it becomes clear that technology alone cannot guarantee equity. Therefore, its effective integration demands intentional pedagogical design, ethical awareness, and genuine, nuanced adaptability to the diverse cognitive, physical, and cultural needs of students. In addition, it is important to avoid the tendency in the scientific literature to overgeneralize or assume the widespread implementation of these principles, as institutional resistance to innovation is challenging in daily practice.

From this perspective, the works compiled herein address these challenges across different dimensions such as adaptive personalization, immersive environments, resource equity, and psychologically conscious design (see [Figure 1](#)). Through specific



use cases, these articles show both the relevance of such innovations and the practical difficulties in their widespread adoption, while also highlighting concrete pathways for improvement that deserve broader dissemination.

2 Synergies and contributions of the Research Topic

The current convergence of generative AI and adaptive systems presents substantial opportunities for learning personalization. Within online formative feedback, generative AI tools have received positive responses among students. Behavioral change and trust directly influence student satisfaction, showing that potential privacy concerns do not necessarily reduce system acceptance (Medina Merodio et al.). This personalization capability improves when educational psychology principles are incorporated into knowledge graphs. A structured adaptive approach can model the needs of vocational training students, optimizing learning pathways through interaction analysis to provide modular support without changing curricular standards (Du et al.). However, the effectiveness of incentives in digital environments

depends on user characteristics. Gamification, implemented via avatars or leaderboards, increases motivation but affects students differently by gender, especially in external regulation (Koch et al.).

Beyond 2D or text-based systems, immersive technologies are also improving spatial orientation and soft skills development. For international students, who face major cultural and administrative barriers in higher education, Virtual Reality (VR) environments with Non-Player Characters (NPCs) driven by Large Language Models (LLMs) offer a safe social “sandbox”. Interaction with these agents reduces social anxiety, allowing learners to practice languages and navigate their surroundings without the fear of human judgment (Berrezueta-Guzman and Wagner).

In creative contexts, AI-driven automation poses the risk of “cognitive offloading,” which could undermine the authorship and critical thinking of design students. To address this behavioral practice, inclusive co-creation with adults with Down syndrome, supported by AI tools, serves as a powerful pedagogical mechanism. This approach promotes self-esteem, competence, and creative self-efficacy, re-centering human intention and shared responsibility over automated production (Chen and Huang).

At a systemic level, the design of educational spaces should promote inclusion and long-term sustainability. A systematic

literature review highlights that the Internet of Things (IoT), AI, and Augmented Reality (AR) can improve accessibility for disadvantaged communities while supporting smart infrastructure aligned with the Sustainable Development Goals (SDGs). However, the review also identifies a current gap in the integration of neuroarchitecture principles into these educational environments (Auquilla Clavijo et al.).

The promise of this educational transformation is linked to the ongoing challenge of the digital divide. To democratize access, it is key to develop efficient technologies capable of operating in low-resource environments. A prominent example is the use of hybrid architectures for voice cloning (GE2E, Tacotron, WaveRNN), which can produce high-quality synthesis using only a few seconds of audio. These architectures make adaptable text-to-speech systems more accessible to students with visual or speech impairments without the need for expensive infrastructure (Mohtad Younus et al.). However, when innovations fail to address language barriers, cultural mismatches, and algorithmic biases, they risk perpetuating the existing inequalities they aim to reduce. Therefore, advancing educational equity requires participatory designs that integrate the languages and contexts of local communities from the early stages of AI models (Matjie et al.).

Collectively, the findings of this Research Topic show that the future of inclusive and sustainable education depends not only on technical advancement, but on interdisciplinary approaches that prioritize empathy, accessibility, and the holistic development of learners. As tools like generative AI, virtual reality, and adaptive algorithms become more integrated into classrooms, academic institutions must remain vigilant to mitigate algorithmic biases and prevent the loss of human agency. The goal of innovation should be to support, not replace, critical thinking and social interaction. This demands universal design principles and institutional policies that tackle the digital divide at its root, ensuring that students from all backgrounds (regardless of neurodiversity, geographical location, language barriers, or socioeconomic status) can participate fully. Only ethical and human-centered approaches form the foundations of learning ecosystems that transform access to education into an equitable and empowering experience for future generations.

Author contributions

VR-B: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. SL-M: Conceptualization, Data curation, Formal analysis, Funding

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that Generative AI was not used in the creation of this manuscript.

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