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# Editorial: Empowerment through education innovative interventions for higher education students

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## Editorial on the Research Topic

### Empowerment through education innovative interventions for higher education students

Higher education is navigating a period of rapid transformation, boosted by the crucial role played by technology, in which student empowerment, learning quality, and equitable outcomes have become central priorities (Akour and Alenezi, 2022). In this context, student empowerment is a multidimensional construct encompassing cognitive agency, self-regulation, social belonging, and the capacity to act meaningfully within and beyond academic environments.

This Research Topic brings together contributions that illuminate how institutions can foster academic success, engagement, and adaptability by rethinking educational systems and assessment practices, leveraging emerging technologies responsibly, and strengthening the psychosocial conditions that sustain student thriving. Taken together, these contributions reveal a vision that is emerging as part of a burgeoning ecosystem of student-centred higher education.

Collectively, the papers span an arc from the governance of generative artificial intelligence (AI) and academic integrity to the redesign of assessment, feedback, and co-teaching practices; from the cultivation of soft skills, leadership, and entrepreneurship to the intra-personal dynamics of self-regulation, engagement, and emotion, alongside discipline-specific inquiries in medical and STEM education. These domains reflect a paradigmatic shift from content transmission models toward holistic and relational paradigms of learning.

A first thread addresses the *dual challenge of AI-era academic integrity and academic writing*. Peterson advances an integrity reporting approach to manage students' use of generative AI, while Sagredo-Ortiz and Kloss design and validate an instrument assessing writing strategies across three disciplinary areas. Together, these contributions foreground the linkage between ethical governance and the measurement of academic practices in an educational landscape increasingly shaped by generative technologies. Recent research suggests that the widespread adoption of AI tools such as large language models is already reshaping students' approaches to academic work, raising

complex questions about transparency, authorship, and assessment design (Saúde et al., 2024).

At the same time, scholars emphasize that responsible integration of AI may enhance learning, personalization, and creativity when accompanied by clear pedagogical frameworks and ethical guidelines (Batista et al., 2024). This tension between augmentation and substitution suggests that future assessment models must move beyond product-oriented evaluation toward process-based, transparent, and reflexive forms of learning evidence.

A second group of contributions centers on *instructional innovation*. Guerra and Meneses reaffirm the foundational role of the basic sciences in engineering education, while Richter et al. theorize co-teaching as a catalyst for scholarly interaction and epistemic humility. Costado reports an assessment and feedback innovation that reconsiders evaluative practices in higher education. Complementing these contributions are several practice-oriented pedagogical models: a four-dimensional aesthetic education framework (Yang et al.), a three-stage problem-based learning approach designed to support “double-weak” students (Huang et al.), multimedia hints that strengthen conceptual problem solving in physics (Wu et al.), and the CERIC method combined with social collaborative annotation to scaffold critical reading (Bjorn). Together, these studies illustrate how curriculum design, multimodal resources, and formative assessment strategies can support deeper learning and conceptual understanding. Importantly, these approaches converge in repositioning assessment not as a terminal act of measurement, but as an integral and continuous component of learning processes.

A third thematic area highlights the *relational and institutional conditions that support student well-being, belonging, and persistence*. The PROTEUS initiative evaluates outcomes of a university-wide student success program (Carneiro Pinto et al.), while Gonçalves et al. demonstrate the positive impact of mentoring on well-being, engagement, and academic achievement. Chan et al. show how structured student–faculty interactions - such as shared meals - can strengthen students’ sense of belonging, and Sampaio et al. describe a career intervention supporting academic adjustment. Barragán Moreno and González Támara further examine the multidimensional dynamics of student dropout. These findings resonate with a growing body of research indicating that mentoring relationships, institutional support structures, and a strong sense of belonging are key predictors of persistence and academic success in higher education (Tinto, 2012; Strayhorn, 2018). However, a critical challenge remains the scalability and sustainability of such interventions within resource-constrained and highly differentiated institutional systems.

Complementing these institutional perspectives, several contributions explore *intra-personal processes that shape learning experiences*. Xu and Yu investigate self-regulated learning using Redit analysis, Bereded et al. examine the mediating role of engagement between emotional intelligence and academic achievement, and Sjølie et al. adopt a person-oriented approach to profiling feedback antecedents. These studies highlight the importance of integrating psychological and pedagogical perspectives in order to better understand how students interpret feedback, regulate their learning processes, and sustain

engagement over time. Bridging these dimensions remains a key theoretical and practical frontier, requiring models that integrate cognitive, affective, and social components of learning.

Finally, the Research Topic turns to *educational technologies and professional development*. Purbasari et al. develop a community-based, socially collaborative e-learning model to enhance student adaptability, while Arapa Mejia et al. examine a chatbot-based conversational agent designed to support first-year student adjustment. In parallel, Mostert et al. foreground the development of soft skills; Almazovaite et al. conceptualize group projects as sites for leadership development; and Paiva et al. propose a model to empower women in technology entrepreneurship. These contributions collectively signal a redefinition of higher education outcomes, extending beyond disciplinary knowledge to include adaptability, leadership, and innovation skills.

Two medical education studies (Lan et al.; Wang et al.) further connect learning behaviors and early research training to clinical preparation and innovation, underscoring the role of higher education in shaping professional identity and interdisciplinary competencies.

Taken together, the contributions in this Research Topic offer an integrated map of evidence and practice that highlights five key priorities for contemporary higher education:

1. redesign teaching and assessment to support meaningful and authentic learning
2. build mentoring, belonging, and well-being as infrastructures of student success
3. harness technology and AI responsibly while safeguarding academic integrity
4. cultivate intra-personal processes such as engagement and self-regulated learning
5. promote soft skills, leadership, and entrepreneurial competencies across disciplines.

These priorities can be conceptualized as interconnected dimensions of a broader student empowerment ecosystem, in which technological, pedagogical, psychological, and social factors dynamically interact.

Despite the breadth of perspectives represented here, several challenges remain open and call for sustained inquiry.

First, the rapid diffusion of generative AI raises unresolved questions about governance, transparency, and pedagogical integration.

Evidence suggests that many students already rely on AI tools when completing academic tasks, often without clear guidance about appropriate use or academic integrity standards (Bearman et al., 2020; Saúde et al., 2024). This situation underscores the need for assessment models capable of distinguishing between productive AI-assisted learning and practices that undermine authentic knowledge construction. Scholars increasingly argue that the future of assessment may lie in more authentic, process-based, and multimodal approaches that emphasize critical thinking and collaboration rather than the mere reproduction of information.

Second, although several contributions highlight the value of mentoring, community building, and career support initiatives,

future research should examine how these interventions can be scaled and sustained within complex institutional ecosystems.

Longitudinal and cross-cultural studies are particularly needed to assess the durability and transferability of belonging-oriented interventions.

Third, the growing attention to psychological dimensions of learning - such as emotional intelligence, engagement, and self-regulation - suggests promising opportunities for integrating cognitive, affective, and pedagogical perspectives in higher education research and teaching. Translating these insights into scalable instructional designs remains a central challenge for both researchers and practitioners (Dweck, 2017).

From an applied perspective, the studies gathered in this Research Topic also highlight the potential for innovation across multiple levels of higher education systems. More fundamentally, they suggest that the future of higher education lies in the capacity to design integrated learning ecosystems that align technological innovation with human development (Zimmerman, 2010).

At the classroom level, the pedagogical models and assessment practices described here provide actionable frameworks that instructors can adapt to promote deeper engagement and conceptual understanding. At the institutional level, mentoring programs, community-building initiatives, and career development interventions demonstrate how universities can construct integrated ecosystems that support both academic persistence and personal development. In this respect, higher education institutions are called upon not only to impart or share knowledge, but also to actively create the conditions that enable students to become independent, reflective and socially responsible individuals.

More broadly, the emphasis on soft skills, leadership, and entrepreneurship reflects the evolving role of universities in preparing graduates not only for employment but also for participation in complex, dynamic, and innovation-driven societies.

In this sense, the contributions collected in this Research Topic illustrate how pedagogical innovation, technological transformation, and student-centered support systems can

converge to shape more inclusive, adaptive, and future-oriented higher education environments.

## Author contributions

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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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