

Multidisciplinarity and technological entrepreneurship as a sustainable strategy for universities in Latin America

Alessandra Amélia Silvério Sudré¹, Annibal Scavarda², Flávio Vaz Machado³.

ABSTRACT

Education 4.0, characterized by the integration of multidisciplinary and technological entrepreneurship, emerges as a sustainable strategy for universities in Latin America, aligned with the search for sustainable development. The use of digital technologies, combined with open innovation and entrepreneurship, stimulates the creation of technological solutions and promotes entrepreneurial capacity in society. Transdisciplinarity plays a crucial role, integrating different fields of knowledge to address the complexities of sustainable development. Transdisciplinary projects, especially in the areas of sustainability and rural development, empower students with core competencies and generate valuable knowledge for rural communities. The inclusion of social innovation in the curricula of higher education institutions reflects the recognition of the importance of multidisciplinary and collaboration in solving multifaceted challenges. Education 4.0 offers a promising path forward for universities in the region, empowering professionals to contribute to a sustainable and innovative future.

Keywords: Multidisciplinarity, Technological entrepreneurship, Sustainable development.

INTRODUCTION

In a global context marked by rapid transformations, Education 4.0 assumes a relevant role, integrating multidisciplinary and technological entrepreneurship as sustainable strategies for universities in Latin America. This approach, enriched by collaboration between diverse disciplines, is aligned with the relentless search for sustainable development, overcoming economic and social barriers (Miranda; Rosas-Fernández; Molina, 2020; Giesenbauer; Müller-Christ, 2020).

The use of digital technologies in education, alongside open innovation and entrepreneurship, encourages the creation of technological solutions, boosting innovation and entrepreneurial capacity in society (Miranda; Rosas-Fernández; Molina, 2020). Transdisciplinarity, in turn, emerges as a crucial element, promoting the integration of different fields of knowledge to effectively address the complexities of sustainable development (Giesenbauer; Müller-Christ, 2020).

Transdisciplinary projects involving students in research and real-world problem-based learning, particularly in the fields of sustainability and rural development, demonstrate the value of Education 4.0 in

¹ Celso Suckow da Fonseca Federal Center for Technological Education (CEFET/RJ) – Rio de Janeiro

² CEFET – Rio de Janeiro

³ Institute of Medical Education (IDOMED) – Rio de Janeiro



empowering students with essential professional competencies while generating valuable knowledge for rural actors (Ácevedo-Osorio; Hofmann-Souki; Cruz Morales, 2019).

The inclusion of social innovation in the curricula of higher education institutions (HEIs) in Latin America reflects a growing recognition of the importance of multidisciplinary and collaboration in addressing multifaceted challenges. These initiatives aim to strengthen participation, collaboration and cooperation with society and its local communities (UNCETA; War; Barandiaran, 2021).

Therefore, Education 4.0, enriched by multidisciplinary and technological entrepreneurship, offers a promising path for universities in Latin America. By adopting these strategies, institutions can not only meet the demands of the labor market but also play an active role in training professionals who are empowered to contribute to a sustainable and innovative future.

In this line of thought, it is understood that multidisciplinary in Education 4.0 not only prepares students for current challenges, but also enables them to be agents of change in the future. The incorporation of different fields of knowledge, such as technology, social sciences, arts, and humanities, creates a rich learning environment that fosters innovation and creativity. Students exposed to this type of education are more adaptable and able to develop sustainable solutions to complex problems, reflecting a truly holistic approach to education (Loureiro; Dieguez; Ferreira, 2022).

The interaction between technological entrepreneurship and multidisciplinary in Education 4.0 fosters an ecosystem in which social innovation can thrive. Educational projects that integrate these concepts help develop essential skills such as critical thinking, problem-solving, collaboration, and leadership. Education 4.0, therefore, not only responds to the needs of the evolving labor market, but also prepares students to contribute positively to their communities and to society at large, promoting sustainable development and social responsibility (Reyes-Plata; Hernández-Morales, 2019).

In the context of Latin America, the implementation of Education 4.0 with a focus on multidisciplinary and technological entrepreneurship presents a unique opportunity for universities to lead social and economic transformation. Collaboration between higher education institutions, the private sector, and local communities can drive innovation and the creation of technological solutions with positive social impact. In this way, Education 4.0 becomes a vector for sustainable development, preparing the next generation to face global challenges with an integrated and innovative approach (Pardo-Garcia; Barac, 2020).

OBJECTIVE

The objective of this study is to present a narrative that addresses the intersection between multidisciplinary and technological entrepreneurship in the context of Education 4.0, highlighting the



implications, challenges and opportunities that this approach presents for universities in Latin America, in order to contribute to sustainable development and educational innovation.

METHODOLOGY

For the elaboration of this article, we opted for a methodological approach centered on a literature review, with the objective of obtaining an in-depth understanding of the integration of multidisciplinary and technological entrepreneurship in the scope of Education 4.0, especially in relation to universities in Latin America. The strategy initially involved the definition of inclusion and exclusion criteria for the selection of materials, favoring journal articles, conferences, and book chapters published between 2014 and 2024, which explicitly addressed the topics of interest and their implications for higher education in the region in question. Publications that did not strictly align with these criteria were disregarded.

Then, a search strategy was developed, employing a combination of keywords and terms related to the topics of Education 4.0 AND multidisciplinary AND education OR educational AND entrepreneurship AND technological OR technology AND innovation AND Latin America. The searches were conducted in the Latin American and Caribbean Health Sciences Database (LILACS) and *the Scientific Electronic Library Online* (SciELO) databases.

The next phase involved the selection and analysis of the identified publications, starting with a preliminary screening based on titles and abstracts to verify adherence to the established inclusion criteria. The publications that underwent this screening were then submitted to a full reading, with the extraction of information that could compose the narrative of this article.

DEVELOPMENT

The intersection of multidisciplinary and technological entrepreneurship in Education 4.0 opens up new avenues for Latin American universities, enabling them to meet the challenges of the 21st century and become catalysts for sustainable development. This approach promotes a synergy between different disciplines, enriching the educational process and preparing students to contribute effectively in a rapidly changing world (Almeida; Simões, 2019). In this way, the incorporation of multidisciplinary in higher education expands the traditional boundaries of learning, encouraging collaboration between different fields such as science, technology, engineering, arts, and mathematics. Thus, one can enrich not only students' educational experience, but also equip them with a deeper and more comprehensive understanding of global challenges, preparing them to develop innovative and sustainable solutions (Roy; Schlosser; Pasek, 2020).

On the other hand, technological entrepreneurship, integrated into the educational curriculum, acts as an engine for innovation and economic development. It encourages students to apply their knowledge



in practical contexts, fostering creativity and the ability to transform innovative ideas into viable technological solutions (Miranda; Rosas-Fernández; Molina, 2020).

Education 4.0, therefore, positions universities as dynamic learning spaces, where knowledge is constantly updated and adapted to the needs of the labor market. By adopting project-based teaching methodologies and experiential learning, educational institutions can provide students with real opportunities to apply their knowledge, collaborate in multidisciplinary teams, and address real challenges, thus preparing them for the future of work (Fiore; Sansone; Paolucci, 2019).

In this context, the emphasis on sustainability within Education 4.0 aligns with the United Nations Sustainable Development Goals (SDGs), promoting an education that not only meets economic demands but also considers the environmental and social impact of technological innovations (Lumsdaine, 2001). However, the successful implementation of Education 4.0 in Latin America faces several challenges, including the need for adequate technological infrastructure, teacher training for new teaching methodologies, and the creation of strategic partnerships with the private sector and non-governmental organizations. Overcoming these obstacles requires a joint commitment from governments, educational institutions, and industry *stakeholders* (Barba-Sánchez; Atienza-Sahuquillo, 2018).

An effective approach to addressing these challenges is the development of collaborative education programmes, which bring together universities, industry, and local communities to co-create curricula that reflect market needs and promote social innovation (Cismaş; Lady; Andreiasu, 2016).

Additionally, universities should adopt a mindset of continuous innovation, regularly re-evaluating and updating their educational programs to reflect technological advancements and changes in the job market. This may involve integrating new learning technologies, such as augmented reality and artificial intelligence, to create more immersive and interactive learning experiences (Nowak, 2020).

Another key aspect is the inclusion of social and emotional skills in the curriculum, such as leadership, teamwork, communication, and resilience. These competencies are essential for success in the modern workplace and can be developed through collaborative activities and interdisciplinary projects that simulate real-world challenges (Sorici et al., 2023).

In theory, Education 4.0, rooted in multidisciplinary and technological entrepreneurship, offers a strategy that can provide a contribution for universities in Latin America to adapt to the demands of the 21st century. By fostering cross-discipline collaboration, innovation, and sustainability, Education 4.0 prepares students not only to thrive in their careers, but also to be agents of positive change in their communities and the world (Ramírez-Montoya; Loaiza-Aguirre; Zúñiga-Ojeda; Castro, 2021).



FINAL THOUGHTS

It presented in a narrative way concepts related to multidisciplinary and technological entrepreneurship in the context of Education 4.0, as well as the implications, challenges and opportunities that this approach can bring to universities in Latin America. The final considerations of this article reveal that such an approach not only meets the requirements of an ever-evolving labor market, but also promotes sustainable development and educational innovation in the region.

It became evident that the successful implementation of this integration requires a commitment from all stakeholders, including educational institutions, governments, the private sector, and the wider community. Significant challenges, such as the need to upgrade technological infrastructure, train teachers, and create strategic partnerships, need to be addressed in order to fully reap the benefits of this educational approach.

This article contributes to the existing literature, providing a brief overview of the benefits and challenges of integrating multidisciplinary and technological entrepreneurship in Education 4.0, with a special focus on Latin American universities. Further research is encouraged to explore effective implementation strategies and assess the impact of this educational approach on student skills development and regional innovation.



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