Educational Innovations for Sustainable Learning in Higher Education: A Systematic Literature Review

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Abstract: *Higher education plays a vital role in supporting the social, economic, and cultural development of global societies. With the advancement of technology and increasing global demands, higher education institutions are required to continuously innovate in order to create relevant and sustainable learning experiences. This study aims to systematically review various educational innovations implemented in higher education to support sustainable learning. Using a PRISMA-based Systematic Literature Review (SLR) approach, 37 articles published between 2020 and 2024 were analyzed. The study identified three main categories of educational innovation: curriculum innovation, instructional innovation, and educational technology innovation. Curriculum innovations include the integration of sustainability principles and the development of 21st-century skills. Instructional innovations involve active learning approaches and personalized learning technologies. Meanwhile, technological innovations focus on the use of AI, AR/VR, and digital learning platforms that enhance interactive and inclusive learning experiences. Despite challenges such as infrastructure gaps, limited faculty training, and unequal access to technology, this study highlights the importance of integrated and sustainable approaches in implementing educational innovations. It provides evidence-based recommendations for higher education institutions to develop more relevant, inclusive, and sustainable learning practices.*

Key Words*:* Educational Innovation; Sustainable Learning; Higher Education; Systematic Literature Review (SLR); Educational Technology

Introduction

Higher education plays a vital role in the social, economic, and cultural development of societies around the world. With the rapid advancement of technology and increasingly complex global demands, higher education systems face the challenge of continuously innovating to provide relevant and high-quality learning experiences. Educational innovation particularly in teaching methods, curriculum design, and the application of technology has become a key focus in enhancing the quality and sustainability of learning in higher education institutions. Numerous studies have demonstrated that the implementation of educational innovations can improve learning outcomes and foster environments that are more adaptive to societal changes.

Educational innovation refers to the introduction of new ideas, methods, and technologies aimed at improving teaching and learning processes. This includes pedagogical practices, technological integration, and institutional transformation intended to enhance educational outcomes (Schophuizen et al., 2022). As a dynamic field, educational innovation addresses the limitations of traditional teaching methods and transforms educational models to meet the evolving needs of students (Álvarez-Vanegas et al., 2024). It integrates new technologies, global perspectives, and inclusive practices to foster creativity, critical thinking,

and collaboration (Maspul, 2024). Ongoing global changes necessitate the incorporation of innovative products and services into education to improve learning results (Fidalgo-Blanco et al., 2019). These innovations may involve the application of educational technologies, changes in teaching methodologies, and the development of responsive curricula aligned with labor market needs and advances in science. They are intended to create dynamic learning environments where students actively engage in their own education, preparing them to face the complexities of modern society and a rapidly changing future (Maspul, 2024).

Therefore, higher education institutions must adapt by integrating Education for Sustainable Development (ESD) into their curricula. Educational innovation is a key pillar in realizing sustainable learning at the tertiary level, and ESD proposed by UNESCO serves as a framework to cultivate knowledge, skills, values, and behaviors among younger generations to support sustainable development(Ujeyo Suubi, 2021). ESD is founded on the premise that sustainable development requires social learning at the community level, as all economic actors must engage in efforts to find pathways toward a more sustainable future (Kohl et al., 2022). Thus, it is essential to integrate ESD as a core element of policymaking and ensure that educational institutions effectively support this mission.

This entails that knowledge production and dissemination cannot remain the sole or primary mandate of educational institutions. Rather, students must also develop the skills and competencies necessary for applying their knowledge through individual action and collective solutions that promote sustainable development. Accordingly, educational innovation becomes imperative for higher education institutions. Despite the widespread adoption of educational innovations in universities, a key issue remains: how to integrate these innovations in ways that support sustainable learning. Innovations in teaching, curriculum, and educational technology are often implemented as short-term solutions or in isolation from the long-term needs of educational institutions and society. This creates a gap between temporary innovations and sustainable implementations that require deeper integration. For instance, many universities adopt new technologies—such as virtual learning environments or digital tools—without embedding them within a pedagogical framework that can evolve and persist over time(Dede, 2014).

Moreover, innovative teaching methods are often not accompanied by relevant curriculum development or ongoing professional training for educators, which limits the effective utilization of such innovations. Another significant barrier is the unequal access to technology, particularly in countries or regions with limited resources. This discrepancy makes it difficult for certain institutions to implement educational innovations that support sustainable learning (Tilbury, 2011) Without appropriate adaptation, introduced innovations may fail to produce meaningful improvements in educational quality and may instead exacerbate inequality in learning opportunities for students across different regions. A major concern is that educational innovations often emphasize technologies or teaching strategies that are not always aligned with the needs or capacities of many higher education institutions, especially in developing countries. For example, implementing advanced digital learning technologies may be challenging in institutions with inadequate infrastructure and limited faculty training (Sterling, 2004). Without sustained support for adaptive curriculum development and ongoing faculty development, these innovations are unlikely to foster learning that is enduring, relevant, and inclusive over time (Lozano et al., 2015).

Furthermore, although sustainable learning necessitates the implementation of accessible and long-lasting innovations, many universities have yet to develop policies that holistically support learning sustainability. Without greater attention to how innovative technologies and teaching methods can be applied in ways that reflect diverse needs and

challenges, the risk of inequality in learning opportunities increases. This may hinder the capacity of education systems to provide equitable access to all students, regardless of their socioeconomic, geographic, or cultural backgrounds (OECD, 2016). To address the challenges in implementing educational innovations that support sustainable learning, higher education institutions must develop more integrated and long-term approaches. One key strategy is to prioritize curriculum development that not only adapts to technological advancements and innovative teaching methods but also focuses on sustainable learning—emphasizing relevance, inclusivity, and long-term impact (Filho et al., 2015). Tackling this issue requires an in-depth examination of the various educational innovations for sustainable learning that have been implemented in higher education, along with a systematic analysis of their impacts, challenges, and potential solutions for achieving enduring learning outcomes. Through a comprehensive literature review, this study will explore various models of educational innovation successfully applied in higher education settings, including those based on technology, curriculum design, and teaching methodologies. By identifying the key factors that support sustainable learning, this research aims to provide more effective recommendations for higher education institutions seeking to implement educational innovations that endure over time.

This study makes a significant contribution to the development of sustainable practices in higher education by offering evidence-based insights into the successes and challenges of implementing educational innovations. Furthermore, it aims to fill existing gaps in the literature by providing a systematic review of diverse innovation approaches that can be adapted by higher education institutions worldwide. In doing so, this research will enrich our understanding of how higher education can innovate to create learning experiences that are more relevant, inclusive, and sustainable in the future

Method

This study employs a Systematic Literature Review (SLR) approach. The systematic review process follows the framework proposed by Denyer & Tranfield, (2009)Denyer and Tranfield (2009), which has also been applied in several other studies (Findler et al., 2019). The procedure adopted in this review uses the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Initially published in 2009, PRISMA provides guidelines for conducting and reporting systematic literature reviews, particularly in the healthcare domain (Pati & Lorusso, 2018).

The Systematic Literature Review process in this study consists of the following five sequential steps:

1. Research Questions: The first step in the SLR is to define the research objectives and formulate clear and specific research questions. The primary research questions guiding this study are:
   RQ 1 *What types of educational innovations are implemented in higher education institutions to support sustainable learning?*
   RQ 2 *What are the main challenges faced by higher education institutions in implementing educational innovations that promote sustainable learning?"*
2. Literature Search: Based on these research questions, this study utilized the electronic database Scopus.com to identify relevant research articles. All selected articles were published in English, within the publication window of five years, from 2020 to 2025. The keywords used in the search were: "Education Innovation" AND "Sustainable

Learning" AND "Higher Education." The subject area was limited to Social Sciences, and only journal articles were considered.

3. Literature Screening: The selection of articles was based on the following inclusion criteria:
   a. Publication Year: 2020–2024
   b. Subject area: Social Science
   c. Journal articles only (excluding books and proceedings)
   d. Publication Stage: Final (fully published articles only)
   e. Language: English
   f. Citation: Only >10
4. Quality Assessment: The quality and relevance of each selected article were assessed by reviewing the abstracts and evaluating their alignment with the study's topic and research questions.
5. Data Extraction: Relevant data from the selected articles were extracted and synthesized narratively. A more detailed overview of the PRISMA procedure adopted in this study can be seen in table 1 below:

Table 1. Procedures PRISMA

Indentification	Search electronic database Scopus.com to identify relevant research articles. The keywords used in the search were: "Education Innovation" AND "Sustainable Learning" AND "Higher Education." N: (1748)
Screening	a. Publication Year: 2020–2024 (N: 1748) b. Subject area: Social Science (N: 1192) c. Source Type: Journal articles only (excluding books and proceedings) (N: 624) d. Publication Stage: Final (fully published articles only) (N: 613) e. Language: English (N: 496) f. Citation > 10 (N:140)
Inclusion	Abstract Screening that are relevant to educational innovation and sustainable learning in higher education institutions (N: 37)

Results and Discussion

The literature reviewed consisted of 37 articles representing the Educational Innovation for Sustainable Learning is still emerging. The distribution of publications per year is presented in Table 2 below.

Tabel 2. The distribution of publications per year

Years	Total Publication
2020	9
2021	5
2022	16
2023	6
2024	1
Total	37

The table 1 presents the distribution of data related to a specific topic or category over the years, from 2020 to 2024. Beginning in 2020, with 9 entries recorded, it was followed by a decline in the number of findings in 2021, which recorded only 5 entries. However, in 2022, there was a significant surge with 16 findings, indicating an increase in activity or focus on the topic. In 2023, the number of findings decreased to 6, while in 2024, only 1 entry was recorded. In total, 37 entries were recorded.

Based on the analysis of 37 articles, educational innovation in higher education that supports Education for Sustainable Development (ESD) can be categorized into three main areas: teaching innovation, technological innovation, and curriculum innovation, as illustrated in Figure 1.

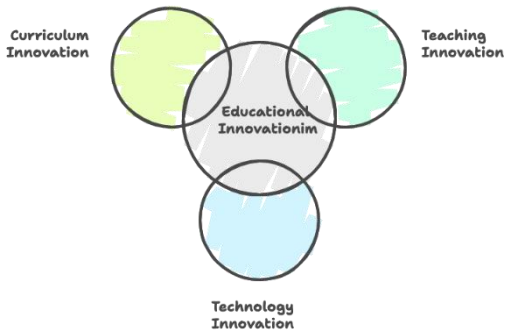

Figure 1. Types of Educational Innovation

Curriculum Innovation

Curriculum innovation focuses on the development and renewal of curricula to align with industry needs and the advancement of scientific knowledge. This includes the integration of sustainability issues into course content, the cultivation of 21st-century skills, and an emphasis on interdisciplinary learning. Innovative curricula equip students to better contribute to an ever-changing society. Curriculum innovation for sustainable learning involves incorporating sustainability principles into educational practices to foster the

knowledge, skills, and attitudes necessary to address global challenges. Research shows that students engaged in SDG-related projects report enhanced sustainable behaviors, reflecting the transformative capacity of experiential and reflective learning. Kelley and Nahser (2014) highlight the importance of engaging students in practical applications to deepen their understanding of sustainability issues, a view supported by Avelar and Farina (2022).

Integrating the SDGs into the curriculum has proven effective in fostering sustainability attitudes among students (Leal Filho et al., 2023). Emphasize that education plays a crucial role in achieving the SDGs by raising awareness and promoting responsible behavior. SDG projects encourage students to critically reflect on their responsibilities in addressing social, environmental, and economic disparities, fostering transformative learning experiences. Higher education institutions play a vital role in supporting curriculum innovation. (Fetters & Duby, 2011). Innovative curriculum is a dynamic and essential component of modern education, aiming to prepare students for success in a rapidly evolving world. By integrating creative problem-solving, cross-disciplinary collaboration, and advanced assessment methods, institutions can foster a culture of innovation that benefits students, educators, and society at large.

Teaching Innovation

Teaching innovation encompasses a variety of approaches and methodologies aimed at enhancing educational practices and outcomes. It has become a fundamental pillar of education, driven by the advancement of emerging technologies (Ramsey et al., 2002)aura, 2022). Teaching innovations that encourage students to assess their own learning and experiences before receiving graded work have proven effective in enabling students who value learning to adopt a holistic view of their academic achievements.(Ramsey et al., 2002).

Such innovations emphasize active learning, including project-based learning (PBL), guided analysis sessions, and experiential opportunities. Institutions are also implementing cooperative problem-solving approaches centered on creativity. Personalized learning systems, driven by algorithms, analyze student performance to provide tailored instruction and adaptive feedback (Miró-Colmenárez et al., 2025). Recent trends in teaching innovation include the integration of emerging technologies, the dissemination of best teaching practices, and an emphasis on evidence-based approaches. However, Challenges in implementing teaching innovations include difficulties in identifying and sharing effective practices, as well as the crucial role of teachers' attitudes toward adopting new instructional methods. Technology has had a significant impact on teaching innovation by making the learning process more engaging and facilitating instructional creativity among educators (Mok et al., 2020). Teaching innovations benefit student learning by deepening content understanding and increasing student engagement and satisfaction. Evaluating the effectiveness of these innovations requires systematic and comprehensive approaches that account for teacher characteristics and individual differences in technology application (Ghory & Ghafory, 2021)

Educational Technology Innovation

The Technology Integration Framework for Education for Sustainable Development is used to evaluate students' awareness of technology-driven elements in sustainable development within higher education institutions ((Shishakly et al., 2024). Framework for Integrating Technology in Sustainable Development Education is used to evaluate students'

awareness of the technology-driven elements in sustainable development within higher education institutions (Milala et al., 2025). Educational Technology Innovation is a dynamic and evolving field that has a significant impact on teaching and learning processes. Educational technology innovation is reshaping the educational landscape by making learning more interactive, personalized, and accessible. Despite the challenges that need to be addressed, the potential benefits for both students and educators are substantial. Ongoing research, investment, and adaptation are crucial to fully realize the advantages of these technological advancements ((Serdyukov, 2017).

Recent innovations in educational technology encompass a range of trends and advancements that are shaping the future of education. These innovations include AI-based intelligent tutoring systems for personalized learning, immersive AR and VR environments, gamified learning platforms, AI-powered teaching assistants, blockchain for secure credentials, centralized learning resources, and global access to MOOCs (Milala et al., 2025). These technologies promise to enhance the learning experience, increase engagement, and streamline the educational process. However, the implementation of these innovations is not without challenges. One of the challenges is that the growth and change in educational practices have not kept pace with the rapid developments in technology, making it difficult to integrate both fields to create novel solutions (Antoniou, 2021) The rate of technological change itself presents a challenge, as the latest technological advancements become obsolete before their potential educational applications are fully tested (Ginting et al., 2023).

The successful integration of Information and Communication Technology (ICT) in education requires creative and visionary strategies and practices from teachers, administrators, and policymakers, as well as addressing the challenges of sustainability and transferability (Serdyukov, 2017). Recent innovations in educational technology offer promising opportunities to enhance the learning experience and student outcomes. However, their implementation comes with challenges and ethical considerations. Moving forward, future educational technology innovations will need to address these challenges and ethical implications while embracing new approaches to curriculum and educational practices..

Conclusion

This study demonstrates that educational innovation in higher education holds significant potential in supporting sustainable learning, particularly through three key areas: curriculum innovation, instructional innovation, and technological innovation. The integration of sustainability principles into curricula, the adoption of innovative and participatory teaching approaches, and the utilization of advanced technologies have all been shown to enhance student engagement and learning outcomes. However, major challenges persist, including limited infrastructure, digital divides, and insufficient training for academic staff. To achieve truly sustainable learning, higher education institutions must adopt a holistic approach that integrates educational innovation into institutional policies, teaching practices, and long-term curriculum development.

This study makes a significant contribution by systematically mapping best practices and offering strategic recommendations for policymakers and educators in strengthening the role of higher education as an agent of change toward a sustainable future. It contributes to the advancement of sustainable learning in higher education through a Systematic Literature Review (SLR) on educational innovation, presenting a structured mapping of three main types

of innovations in higher education: curriculum innovation, instructional innovation, and educational technology innovation—all of which support sustainable learning. Future research is recommended to incorporate a broader range of international databases and extend the publication timeframe to provide a more comprehensive and in-depth overview of innovation trends in higher education.

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