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Barriers to Implementing Innovative Pedagogy: A Systematic Review of Challenges and Strategic Solutions

Nurul Eeffah Awang, Mohd Isa Hamzah* and Hafizhah Zulkifli
National University of Malaysia

Abstract. Innovative pedagogy has emerged as a cornerstone of modern education, aiming to foster critical thinking, creativity, and problem-solving among learners. However, its implementation remains hindered by numerous challenges, including teacher preparedness, technological limitations, curriculum misalignment, and socio-cultural resistance. This systematic literature review examined 17 peer-reviewed articles published from 2022 to 2024, retrieved from SCOPUS and Web of Science, to identify and synthesize the barriers to adopting innovative pedagogical practices. Employing a structured methodology based on PRISMA guidelines, this review categorized the challenges into eight key areas: student-related, teacher-related, curricular, technological, infrastructural, school leadership, policy-related, and socio-cultural barriers. These interconnected challenges underscore the need for comprehensive interventions, such as targeted professional development programs, strategic investments in infrastructure, culturally responsive strategies, and flexible policies. Future research should focus on longitudinal teacher training studies, AI-driven adaptive learning pilots, and competency-based policy evaluations. A collaborative approach among educators, policymakers, and technology developers is crucial for fostering equitable and sustainable pedagogical transformation.

Keywords: Barriers; challenges; innovative pedagogy; innovative teaching; strategic; systematic review

1. Introduction

Education is continuously evolving to adopt innovative pedagogy, shifting from traditional lecture-based instruction to learner-centered, competency-based, and technology-integrated approaches (Bhuttah et al., 2024; Hamadneh et al., 2025; Valdés & Gutiérrez-Esteban, 2023). These approaches, including problem-based learning, flipped classrooms and experiential learning, promote critical thinking, collaboration, and active engagement (Muniandy & Abdullah, 2023; Valle, 2024). Entrenched in constructivist learning theories, innovative pedagogy encourages

*Corresponding author: Mohd Isa Hamzah; *isa_hamzah@ukm.edu.my*

students to build knowledge through experiences rather than passive memorization (Kaldaras & Wieman, 2023). However, while these pedagogical models have demonstrated effectiveness, their adoption varies widely across educational institutions.

Innovative pedagogy incorporates blended learning models, integrating digital tools to enhance learning flexibility and personalized instruction (Hamonic et al., 2023; Hanč et al., 2023). Active learning strategies, such as case-based learning, collaborative group work and simulation-based learning, further improve student motivation and knowledge retention (Kaldaras & Wieman, 2023). However, the successful implementation of these methods depends on institutional readiness, teacher competency, and adaptive curriculum structures (Lomba-Portela et al., 2022). Many institutions struggle with transitioning from traditional didactic teaching to interactive, student-driven models, emphasizing the need for comprehensive frameworks to guide this transformation (Mulenga & Shilongo, 2024).

Despite its potential, the adoption of innovative pedagogy faces systemic barriers that hinder its effectiveness in real-world applications. Teacher preparedness and professional development are critical factors, as many educators lack the necessary training, digital literacy, and institutional support to transition to student-centered methodologies (Smith et al., 2023; Tahir et al., 2024). Research highlights that ongoing teacher training programs and mentorship initiatives significantly improve pedagogical adaptation, yet inconsistent professional development remains a barrier (Basri et al., 2024; Devika et al., 2024). Additionally, high workloads, lack of incentives, and resistance to pedagogical change further contribute to slow adoption (Iqbal et al., 2022; Mulenga & Shilongo, 2024; Tahir et al., 2024).

Institutional and policy constraints also play a significant role in determining the success of innovative pedagogy. Many education systems still rely on standardized assessments and rigid curricula, limiting opportunities for competency-based, adaptive learning models (Georgia et al., 2024; Khodamoradi, 2024). Studies emphasize the importance of policy reforms that allow greater curriculum flexibility, enabling institutions to adopt alternative assessment methods and interdisciplinary coursework (Muniandy & Abdullah, 2023; Smith et al., 2023). Without such flexibility, educators face difficulties in aligning modern teaching methodologies with traditional education structures (Lomba-Portela et al., 2022).

Socio-cultural perceptions further shape the extent to which innovative pedagogy is accepted and implemented. In many regions, teacher-centered instruction remains the dominant approach, leading to skepticism about interactive and technology-enhanced learning models (Georgia et al., 2024; Qassrawi et al., 2024). Moreover, parental expectations, institutional norms, and examination-driven education systems also reinforce hesitation in adopting student-directed instructional techniques (Devika et al., 2024). Research suggests that policy interventions and awareness initiatives are essential in promoting broader

acceptance of student-centered, competency-based learning models (Llorent-Vaquero et al., 2024). However, overcoming these barriers requires a coordinated effort from educators, policymakers, and institutions to create adaptive, flexible learning environments that align with evolving educational demands.

While extensive research supports the benefits of innovative pedagogy, its adoption remains inconsistent and fragmented across educational settings. Many studies fail to examine the interconnected nature of factors affecting implementation, often focusing on isolated challenges without considering the broader institutional, policy, and socio-cultural influences (Lan & Oanh, 2024; Valdés & Gutiérrez-Esteban, 2023). Additionally, while technology-enhanced learning strategies are widely discussed, there is a lack of research on how these tools can be systematically integrated into long-term pedagogical frameworks (Muniandy & Abdullah, 2023). Addressing these gaps requires a comprehensive understanding of the systemic challenges and strategic solutions that support educational transformation.

Given these research gaps, this study aimed to:

1. Identify the key barriers and challenges that hinder the successful implementation of innovative pedagogy across different educational settings.
2. Propose strategic solutions and evidence-based recommendations to facilitate the effective adoption of innovative teaching methodologies.

By addressing these objectives, this research provides practical recommendations for integrating modern teaching strategies, contributing to ongoing efforts to modernize education and offering valuable insights for educators, policymakers, and researchers working toward sustainable pedagogical transformation.

2. Methodology

This systematic literature review follows the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines. PRISMA is defined by three key principles: (1) it ensures systematic reviews have well-defined research questions, (2) it establishes clear inclusion and exclusion criteria, and (3) it facilitates access to relevant studies across multiple databases within a specified timeframe (Sierra-Correa & Cantera-Kintz, 2015). Consequently, PRISMA serves as a structured and effective framework for this systematic literature review, supporting the identification of barriers to implementing innovative pedagogical approaches in data analysis.

2.1 Search Strategy

This study adhered to key steps in the systematic review process to compile a comprehensive body of relevant literature. The process began with selecting keywords, followed by identifying related terms through dictionaries, thesauri, encyclopedias, and prior research. All relevant terms were systematically compiled to develop search strings for the Scopus and Web of Science (WoS) databases (as outlined in Table 1). This initial phase of the review resulted in the retrieval of 7085 publications relevant to the study topic from both databases.

Table 1: String Key

Database	Keyword
Scopus	TITLE-ABS-KEY ((*innovative AND pedagogy* OR *innovative AND teaching*)) AND ((barriers OR challenges))
WoS	(''innovative AND pedagogy'' OR ''innovative AND teaching'' AND '' barriers OR challenges '') (Topic)

2.2 Selection Criteria

To ensure the selection of relevant and high-quality articles, multiple filtering stages were applied to the initially retrieved publications. First, studies had to be directly related to the research topic, specifically addressing barriers or challenges in implementing innovative teaching practices across various contexts. Articles that were not relevant to the research focus were excluded to maintain the quality and specificity of the discussion. Second, only peer-reviewed journal articles indexed in SCOPUS and WoS were included to uphold academic rigor and credibility. These databases are widely used in systematic reviews due to their extensive coverage, citation tracking, advanced search functionalities, and data reliability. Scopus and WoS index a vast range of peer-reviewed journals across multiple disciplines, ensuring access to a broad and relevant body of literature (Haddaway et al., 2015). Additionally, their robust citation analysis tools facilitate the tracking of research impact and interconnections over time, making them invaluable for identifying key studies and research trends (Gusenbauer & Haddaway, 2020). Furthermore, conference papers, book chapters, and grey literature were excluded, as they may not have undergone the same rigorous peer-review process as journal articles. The inclusive and exclusive criteria area shown in Table 2.

Table 2: Inclusive and exclusive criteria

Criterion	Inclusive	Exclusive
Focus	Barriers or challenges in implementing innovative teaching practices across various contexts	Articles that were not relevant to the research focus
Literature type	Journal (Article)	Conference papers, book chapters, grey literature
Language	English	Language other than English

2.3 Article Selection Process

PRISMA's methodology follows a structured four-phase process: identification, screening, eligibility, and data abstraction. During the identification phase, relevant studies are gathered through comprehensive database searches. The screening phase then filters these studies based on predefined criteria, eliminating those that are irrelevant or of low quality. Next, in the eligibility phase, the remaining studies undergo thorough evaluation to confirm they meet the inclusion requirements. Lastly, data abstraction involves extracting and synthesizing key information from the selected studies, ensuring reliable and

meaningful conclusions. This systematic approach enhances the rigor of reviews, providing credible insights for future research and practical applications.

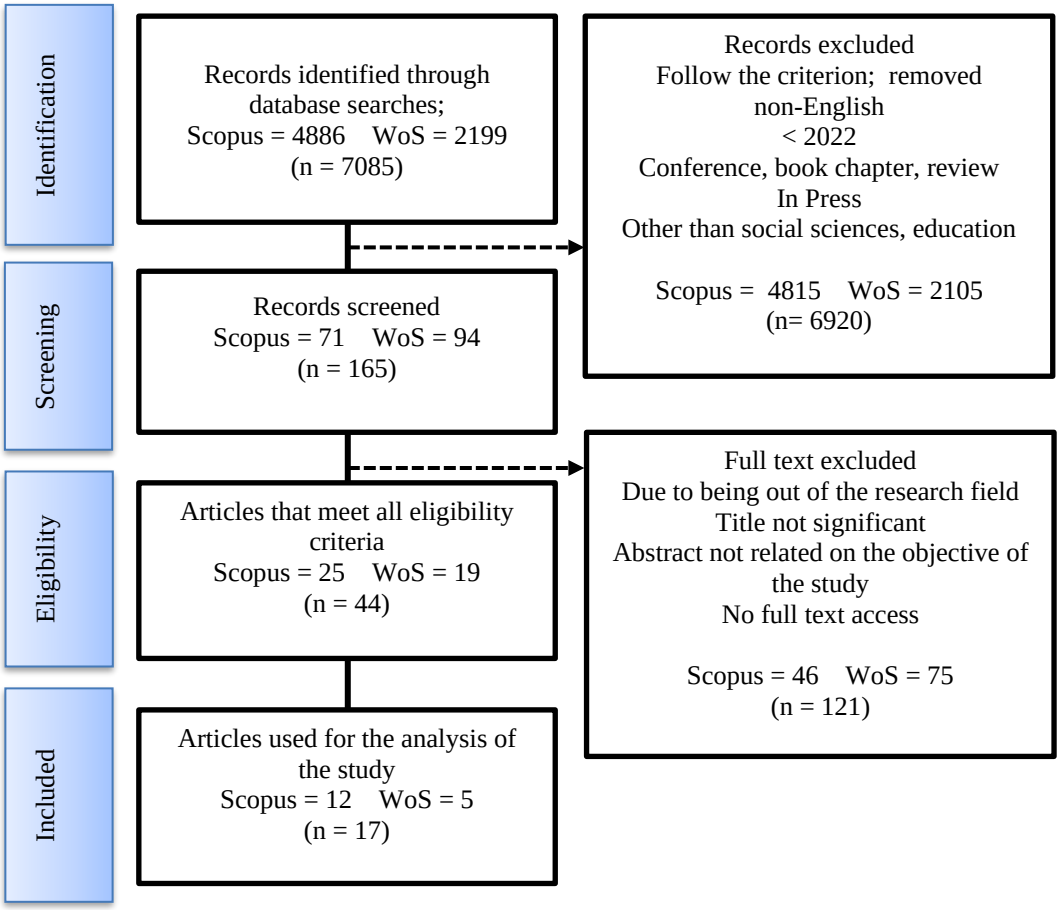

Figure 1: Flowchart of the articles selection process

During the review process, 165 articles were initially shortlisted for evaluation. However, as various exclusion criteria were applied at different stages, several studies were removed. Reasons for exclusion included lack of relevance to the research field, titles that did not sufficiently address the main research question, and abstracts misaligned with the study's objectives. Additionally, some articles were excluded due to unavailable full-text access, preventing a thorough assessment. Consequently, 121 articles were removed, leaving 17 studies for further analysis.

These 17 studies were deemed highly relevant and contained sufficient data for qualitative analysis, enabling a detailed and in-depth exploration of the research topic. This refined selection ensured a comprehensive understanding of the subject and contributed valuable insights to the overall study.

2.4 Quality Assessment

Two experts conducted a quality assessment during the article selection process. If disagreements arose, a third expert was consulted to facilitate consensus. This

approach aligned with the methodology outlined by Wu et al. (2018), ensuring a rigorous and unbiased selection process.

2.5 Data Analysis

Finally, the remaining articles underwent a comprehensive analysis to eliminate those that did not align with the research objectives. After this systematic search and filtering process, a total of 18 articles were selected for inclusion (refer to Appendix 1).

3. Result

This section presents a comprehensive analysis of the challenges associated with implementing innovative pedagogy. The challenges were categorized into eight key areas: student-related, teacher-related, curricular, technological, infrastructural, school leadership, policy-related, and socio-cultural barriers. These categories were derived through a combination of previous literature and inductive coding from the reviewed articles. The challenges were not isolated; rather, they overlapped and influenced each other, necessitating a holistic approach to addressing them. The results discuss how these challenges interconnect and influence one another while considering solutions and ethical frameworks, such as the UNESCO *Recommendation on the ethics of artificial intelligence* (2021).

3.1 Student-Related Challenges

Students encounter multiple barriers in adapting to innovative pedagogy, with socioeconomic factors playing a significant role. Limited access to technology exacerbates educational disparities, creating an unequal learning environment in which students from lower-income backgrounds struggle to engage in technology-integrated education (Mashishi & Ramaila, 2024; Ramulumo et al., 2024). The digital divide, characterized by the unequal distribution of technological resources, disproportionately affects students in underprivileged communities, making it difficult for them to benefit from modern pedagogical approaches. Furthermore, students in remote areas often face difficulties in accessing quality education due to inadequate internet connectivity and a lack of necessary learning tools (Garba & Abdulhamid, 2024).

In addition to economic barriers, cultural resistance to student-centered learning persists in many regions, particularly in Arabic-speaking countries where conventional teacher-led instruction remains dominant (Almakky, 2024). This reluctance to embrace digital learning tools results in low engagement levels and difficulties in adapting to innovative pedagogies. Parents and educators in these contexts often view active learning strategies, such as problem-based learning and flipped classrooms, as less effective than traditional methods, which focus on rote memorization and teacher authority (Lan & Oanh, 2024). Psychological factors, such as learning anxiety and lack of confidence in digital tools, also hinder students' ability to participate effectively (Qassrawi et al., 2024). These factors highlight the need for inclusive educational policies that cater to students' diverse learning styles and provide adaptive strategies for different socioeconomic and cultural contexts.

To address these challenges, institutions must implement structured digital literacy programs that introduce students to emerging technologies in an inclusive and accessible manner (Lan & Oanh, 2024). Providing financial aid and technological resources to economically disadvantaged students can bridge the digital divide. Moreover, culturally responsive teaching methods, institutional engagement strategies, and tailored support mechanisms are necessary to enhance student motivation and participation (Valdés & Gutiérrez-Esteban, 2023). Governments should collaborate with educational institutions to establish equitable policies that ensure all students, regardless of socioeconomic background, have access to high-quality education. Furthermore, integrating peer mentoring and counseling support systems can help students navigate their psychological barriers and develop confidence in technology-enhanced learning environments (Herrera & Chugai, 2024).

3.2 Teacher-Related Challenges

Teachers play a pivotal role in implementing innovative pedagogy, yet they encounter numerous challenges, primarily due to insufficient professional development opportunities. Many educators lack access to comprehensive training programs that would equip them with the necessary digital literacy skills to transition into modern pedagogical practices (Devika et al., 2024; Noor et al., 2024). This gap in professional development was especially evident during emergency remote teaching, where educators struggled with technological adoption and pedagogical adjustments (Sadıç & Bavlı, 2024). Without adequate training, teachers may feel unprepared to integrate new teaching methods effectively, leading to hesitation and inconsistent adoption of innovative pedagogies (Tahir et al., 2024).

Resistance to adopting new methodologies also persists due to the heavy workload placed on teachers. Many educators perceive innovation as an added burden rather than an enhancement, particularly when they lack institutional support and incentives (Herrera & Chugai, 2024). Institutional barriers, such as rigid administrative policies, further deter teachers from experimenting with student-centered teaching strategies (Basri et al., 2024). Research has shown that strong leadership and supportive school environments play a crucial role in motivating teachers to adopt new practices (Valdés & Gutiérrez-Esteban, 2023).
Addressing these challenges requires a multi-pronged approach that includes structured training programs, clear administrative support, and well-defined policies to encourage pedagogical innovation (Llorent-Vaquero et al., 2024). Schools should invest in long-term professional development initiatives, integrate digital competency training into teacher education curricula, and implement incentive programs to encourage adoption (Alansari & Li, 2024). Additionally, establishing professional learning communities can facilitate knowledge-sharing and continuous professional growth among educators. Schools must also promote workload redistribution strategies, such as employing teaching assistants or collaborative teaching models, to alleviate teacher burnout and create an environment in which innovation can thrive (Tahir et al., 2024).

3.3 Curricular-Related Challenges

A key obstacle to implementing innovative pedagogy is the misalignment between curriculum design and contemporary educational needs. Many curricula fail to integrate modern pedagogical models effectively, creating a disconnect between theoretical knowledge and real-world application (Devika et al., 2024; Khodamoradi, 2024). For instance, in the Philippine Science, Technology, and Engineering Program, a lack of alignment between teacher expertise and curriculum content has hampered efforts to teach specialized subjects like biotechnology (Elladora et al., 2024). Likewise, Iranian schools have struggled to implement communicative language teaching (CLT) due to rigid curriculum structures (Khodamoradi, 2024). These limitations indicate the need for dynamic curriculum reforms that ensure alignment with industry trends and the evolving global education landscape.

Another major challenge is the persistence of outdated assessment frameworks, which prioritize standardized testing over interdisciplinary and student-centered learning. Llorent-Vaquero et al. (2024) emphasized that participatory curriculum development and dynamic policy models are essential for addressing these misalignments. Policymakers must work collaboratively with educators to develop flexible curricula that incorporate problem-based learning, interdisciplinary projects, and alternative assessment methods (Muniandy & Abdullah, 2023). Implementing pilot programs and continuously refining curriculum structures based on educator feedback can facilitate more effective curricular innovation. Schools should integrate more competency-based assessments to ensure students develop essential skills relevant to the evolving job market. Additionally, embedding technology-driven learning analytics can provide educators with real-time insights into student progress, allowing for a more tailored and adaptive approach to curriculum implementation.

3.4 Technology-Related Challenges

The integration of technology in education remains a significant challenge, particularly in institutions with inadequate digital infrastructure. Many schools, especially in low-income regions, lack essential tools such as computers, learning management systems (LMS), and digital assessment platforms (Garba & Abdulhamid, 2024). The lack of reliable internet connectivity further restricts the ability of students and teachers to engage in online and blended learning environments. As a result, students from underprivileged backgrounds often fall behind in acquiring the digital competencies necessary for modern education and employment (Llorent-Vaquero et al., 2024). The digital divide exacerbates learning inequalities, preventing equitable access to quality education and limiting opportunities for students in underserved communities (Lan & Oanh, 2024).

Beyond infrastructure, digital literacy remains a key barrier among both educators and students. Many teachers lack the necessary training to effectively incorporate technology into their pedagogy, leading to inconsistent and ineffective use of digital tools in classrooms (Sadıç & Bavlı, 2024). Students, particularly those with limited prior exposure to digital learning, struggle to navigate online platforms, which negatively impacts engagement and learning

outcomes (Almakky, 2024). To address these issues, institutions should implement targeted digital literacy programs for both teachers and students, along with providing ongoing professional development for educators to enhance their technological proficiency (Georgia et al., 2024). Furthermore, policies promoting ethical artificial intelligence (AI) use, data privacy, and equitable access to digital resources must be prioritized (UNESCO, 2021). Increased collaboration between educational institutions, government agencies, and private technology firms can also facilitate widespread access to innovative digital tools, ensuring that no student is left behind (Muniandy & Abdullah, 2023).

The challenge of technological integration is also linked to infrastructural limitations. Schools with outdated infrastructure struggle to accommodate modern digital tools, further hindering technology adoption (Garba & Abdulhamid, 2024). Additionally, some educators expressed reluctance toward digital learning due to concerns over job security and the fear that automation could replace traditional teaching methods (Valdés & Gutiérrez-Esteban, 2023). Addressing these concerns through structured policies, incentives, and training programs can help ensure a smoother transition to technology-enhanced education (Herrera & Chugai, 2024).

3.5 Infrastructure-Related Challenges

Insufficient infrastructure remains a significant challenge in the widespread adoption of innovative pedagogy. Many schools, particularly in developing regions, lack essential physical resources such as modern classrooms, high-speed internet, and digital learning hubs (Garba & Abdulhamid, 2024). Without these facilities, implementing student-centered learning models that require flexible and technologically equipped spaces becomes difficult. Disparities in infrastructure funding between urban and rural schools further exacerbate educational inequalities, making it harder for underprivileged students to access high-quality learning environments (Muniandy & Abdullah, 2023). Moreover, schools in marginalized communities often rely on outdated facilities, further limiting the integration of digital tools and modern pedagogical approaches (Basri et al., 2024).

A lack of adaptive learning spaces also contributes to the difficulty in implementing innovative pedagogy. Traditional classrooms are often designed for lecture-based instruction rather than collaborative, technology-driven learning models (Llorent-Vaquero et al., 2024) and, as such, rigid seating arrangements and limited access to modern digital tools make it challenging to implement inquiry-based and interactive learning approaches (Tahir et al., 2024). To address these challenges, governments and educational stakeholders must prioritize investments in infrastructure modernization, ensuring all schools benefit from the necessary resources to support new teaching methodologies (Basri et al., 2024). Public-private partnerships can also facilitate resource-sharing initiatives, such as providing subsidized internet access and digital learning materials for underprivileged schools (Llorent-Vaquero et al., 2024). Additionally, educational policies must include provisions for equitable resource distribution

to bridge the gap between well-funded and under-funded schools (Herrera & Chugai, 2024).

Infrastructure challenges also affect teacher performance and student outcomes. Without access to modern classroom technology, teachers are unable to fully implement innovative pedagogical strategies, limiting student engagement and overall academic performance (Noor et al., 2024). Furthermore, the absence of robust digital infrastructure makes it difficult to conduct remote or hybrid learning programs, exacerbating learning loss in times of crisis, such as during pandemics. Addressing these issues requires long-term infrastructure planning and sustainable investment in educational technology (Tahir et al., 2024).

3.6 School/Leadership-Related Challenges

Strong and effective school leadership is crucial in fostering an environment that supports innovative pedagogy. However, many school administrators face resistance to change from teachers, policymakers, and parents who are accustomed to traditional teaching models (Tahir et al., 2024). Leaders often struggle with encouraging educators to adopt digital learning tools and student-centered methodologies, particularly in institutions in which traditional lecture-based instruction is deeply embedded (Valdés & Gutiérrez-Esteban, 2023). Without adequate professional development, school leaders may lack the knowledge and confidence to guide their institutions through technological and pedagogical transformation (Herrera & Chugai, 2024). Furthermore, school administrators often prioritize administrative tasks, such as budgeting and compliance with rigid education policies, leaving little room to focus on instructional leadership and innovation (Basri et al., 2024).

Another major challenge is the lack of autonomy granted to school leaders in decision-making processes related to curriculum adaptation and digital transformation. In many centralized education systems, administrators have limited authority to implement innovative pedagogical practices, as they must adhere to national education policies that emphasize standardized testing and rigid assessment frameworks (Llorent-Vaquero et al., 2024). This limitation stifles creativity and prevents schools from tailoring instruction to meet the needs of diverse student populations. To address these challenges, leadership training programs must be implemented to equip school administrators with the skills necessary to drive change effectively (Muniandy & Abdullah, 2023). Encouraging collaborative decision-making models, in which teachers and school leaders jointly participate in shaping instructional strategies, can also promote a culture of innovation and continuous improvement (Tahir et al., 2024).

School leadership challenges are closely linked to infrastructural and technological barriers. Without access to modern infrastructure, school leaders may struggle to implement innovative learning strategies that require digital tools and flexible learning spaces (Garba & Abdulhamid, 2024). Additionally, a lack of policy support for leadership development further hampers the ability of school administrators to drive meaningful change in education (Llorent-Vaquero et al., 2024). Providing targeted funding for leadership development initiatives and

granting greater autonomy to school leaders can help bridge these gaps and create sustainable pathways for pedagogical innovation (Valdés & Gutiérrez-Esteban, 2023).

3.7 Policy-Related Challenges

Education policies play a significant role in shaping how innovative pedagogy is implemented. However, many existing policies are outdated and fail to accommodate modern teaching strategies, such as blended learning, competency-based education, and flipped classrooms (Muniandy & Abdullah, 2023). Bureaucratic inefficiencies further hinder the approval process for experimental teaching methods, discouraging educators from adopting new pedagogical approaches (Basri et al., 2024). Additionally, standardized testing remains a dominant assessment model in many education systems, limiting the flexibility needed to incorporate interdisciplinary, student-centered learning experiences (Llorent-Vaquero et al., 2024). These rigid policy structures prevent teachers from adapting curricula to suit the needs of diverse learners and emerging workforce demands.

In many cases, inconsistencies in policy implementation create disparities in how innovation is adopted across different educational institutions. While some schools have the autonomy to pilot alternative teaching methods, others remain constrained by centralized education systems that enforce uniform curricula and rigid assessment models (Herrera & Chugai, 2024). The lack of alignment between policy frameworks and technological advancements further exacerbates the problem, as many education systems fail to integrate guidelines for ethical AI use, digital assessments, and personalized learning (UNESCO, 2021). This misalignment hinders the adoption of technology-enhanced learning environments, preventing students from developing the skills necessary for success in the digital age (Garba & Abdulhamid, 2024).

To address these challenges, education policymakers must adopt more flexible regulatory frameworks that encourage experimentation and innovation in teaching and learning (Valdés & Gutiérrez-Esteban, 2023). Policymakers should work closely with educators, researchers, and industry experts to ensure that policies align with evolving pedagogical needs and labor market trends (Llorent-Vaquero et al., 2024). Additionally, financial incentives and policy support for institutions that successfully integrate innovative teaching practices can drive systemic change and encourage more widespread adoption of transformative educational strategies (Tahir et al., 2024).

3.8 Socio-Related Challenges

Socio-cultural factors play a significant role in determining how receptive students, teachers, and parents are to innovative pedagogy. In many societies, traditional education models that prioritize teacher-led instruction, rote memorization, and standardized testing are deeply ingrained (Almakky, 2024). As a result, efforts to introduce student-centered learning approaches, such as inquiry-based learning and collaborative problem-solving, are often met with skepticism and resistance (Lan & Oanh, 2024). Educators who attempt to implement innovative teaching methods may face opposition from parents who

associate success with rigid, exam-driven instruction rather than holistic learning experiences (Qassrawi et al., 2024). Additionally, students who have been conditioned to rely on passive learning models may struggle with the transition to active, technology-enhanced learning environments.

Another socio-cultural challenge stems from disparities in access to education and digital resources. Students from lower-income backgrounds often lack access to personal learning devices, stable internet connections, and quiet study spaces, putting them at a disadvantage in technology-driven educational settings (Garba & Abdulhamid, 2024). Furthermore, gender disparities and socioeconomic inequities continue to impact participation in digital learning programs, with marginalized communities often having limited representation in STEM fields and other emerging disciplines (Valdés & Gutiérrez-Esteban, 2023). These inequities highlight the need for inclusive education policies that ensure all students, regardless of socioeconomic background, have equal access to high-quality learning experiences (Muniandy & Abdullah, 2023).

To overcome socio-cultural barriers, community engagement initiatives should be developed to promote awareness of the benefits of innovative pedagogy (Herrera & Chugai, 2024). Schools should work collaboratively with parents, local communities, and policymakers to build trust and demonstrate the effectiveness of student-centered learning approaches (Llorent-Vaquero et al., 2024). Additionally, scholarship programs, subsidized internet access, and digital equity initiatives can help bridge socioeconomic gaps and ensure that all students have the opportunity to engage in modern educational practices (Garba & Abdulhamid, 2024). By addressing these socio-cultural challenges, educators and policymakers can create more inclusive, adaptive, and effective learning environments that prepare students for the demands of the 21st-century workforce (Valdés & Gutiérrez-Esteban, 2023).

3.9 Other Main Challenges

Beyond the key barriers discussed, several additional challenges complicate the implementation of innovative pedagogy. One such issue is the ethical concerns surrounding AI and big data in education. As digital learning tools become more prevalent, concerns over student data privacy, algorithmic bias, and the ethical implications of AI-driven assessments are growing (Achruh et al., 2024). AI-powered learning analytics have the potential to enhance personalized learning, but they also raise questions about transparency, consent, and the extent to which student data should be monitored (UNESCO, 2021). Without clear regulatory frameworks, educational institutions risk violating ethical standards, thereby diminishing trust in digital education initiatives (Garba & Abdulhamid, 2024). Addressing these concerns requires a balanced approach that prioritizes ethical AI use while promoting technological advancements in education (Muniandy & Abdullah, 2023).

Another major challenge is communication barriers in technology-driven learning environments. Many students and educators struggle with digital collaboration, particularly in remote or hybrid learning settings where face-to-face interactions

are limited (Qassrawi et al., 2024). Differences in digital fluency among students further complicate peer interactions, making it difficult to foster meaningful engagement and teamwork in online spaces. Additionally, cultural and linguistic differences may create further barriers to communication in globally connected digital classrooms (Lan & Oanh, 2024). To mitigate these challenges, institutions should integrate structured digital communication training into their curricula, ensuring that students and educators are well-equipped to collaborate effectively in virtual learning spaces (Llorent-Vaquero et al., 2024). Moreover, adaptive AI-driven language support tools can help bridge communication gaps and enhance inclusivity in diverse educational settings (Herrera & Chugai, 2024).

A third pressing issue is the governance and accountability of AI and technology-enhanced education. While digital tools can enhance pedagogical effectiveness, their integration requires comprehensive governance strategies to ensure fair access and prevent educational inequalities (Basri et al., 2024). Policymakers and educators must work together to establish robust governance frameworks that oversee the ethical deployment of AI, prevent algorithmic biases, and ensure equitable access to digital education resources (Valdés & Gutiérrez-Esteban, 2023). Without these safeguards, there is a risk of deepening existing socioeconomic disparities, as wealthier institutions with greater technological investments gain an advantage over underfunded schools (Garba & Abdulhamid, 2024). Creating policy frameworks that promote responsible technology use in education is essential for ensuring sustainable and inclusive pedagogical transformations (UNESCO, 2021).

4. Discussion

This study systematically examined the key barriers hindering the successful implementation of innovative pedagogy in education. The findings underscore the complexity of transitioning from traditional, teacher-centered methodologies to student-centered, technology-enhanced learning models. These challenges stem from technological, infrastructural, policy-related, socio-cultural, and leadership barriers, all of which hinder the adoption of transformative pedagogical approaches. The evidence highlights that digital literacy deficits, inadequate infrastructure, policy inflexibility, and cultural resistance collectively contribute to the slow adoption of innovative teaching methodologies, reinforcing disparities across educational institutions (Garba & Abdulhamid, 2024; Muniandy & Abdullah, 2023). Addressing these obstacles requires a holistic, multi-level approach that aligns institutional, technological, and policy-driven solutions with the evolving demands of education.

A significant finding of this study is that technological and infrastructural limitations remain the foremost barriers, disproportionately affecting underfunded institutions (Garba & Abdulhamid, 2024). The digital divide, intensified by disparities in internet access and uneven resource distribution, restricts equal learning opportunities, particularly among marginalized student populations (Llorent-Vaquero et al., 2024). Further, teacher preparedness and institutional inertia significantly hinder pedagogical transformation, as many educators lack sufficient training, incentives, and support to integrate digital tools

effectively into their instructional practices (Sadıç & Bavlı, 2024; Tahir et al., 2024). Without targeted professional development programs, the potential of technology-enhanced learning remains underutilized, exacerbating disparities in student outcomes.

Additionally, policy rigidity and socio-cultural resistance present formidable obstacles to educational innovation. Many national education systems emphasize standardized testing and rigid curriculum structures, discouraging schools from experimenting with adaptive, student-centered learning frameworks (Muniandy & Abdullah, 2023). Cultural biases favoring lecture-based instruction further limit the acceptance of active learning strategies, particularly in regions where traditional pedagogy is deeply ingrained in educational norms (Almakky, 2024; Qassrawi et al., 2024). Moreover, ethical concerns surrounding AI, student data privacy, and algorithmic bias emphasize the necessity for robust governance frameworks that ensure responsible digital transformation in education (UNESCO, 2021). These findings highlight the need for a cohesive policy ecosystem that facilitates pedagogical experimentation, ethical AI integration, and flexible learning environments.

To address these challenges effectively, targeted interventions must focus on enhancing teacher training, expanding digital infrastructure, reforming policies, and fostering community engagement. First, teacher training and professional development programs must be expanded to equip educators with technological proficiency, student-centered teaching strategies, and interdisciplinary instructional approaches (Tahir et al., 2024). Governments and institutions should establish continuous digital literacy programs, peer mentorship initiatives, and instructional technology workshops to help educators transition toward innovative pedagogies (Herrera & Chugai, 2024). Additionally, workload redistribution strategies, such as the use of teaching assistants and collaborative planning models, can help reduce teacher burnout and encourage sustained engagement with digital tools (Llorent-Vaquero et al., 2024). Without structured professional development, teachers will remain hesitant to integrate innovative practices, thereby limiting the effectiveness of student-centered learning models.
Another critical step is investing in digital infrastructure and equitable access to technology. Policymakers must prioritize long-term funding for high-speed internet, digital learning resources, and adaptive classroom environments to close the digital divide (Garba & Abdulhamid, 2024). Public-private partnerships can facilitate cost-effective technological solutions for underfunded schools, ensuring universal access to digital learning tools (Basri et al., 2024). Furthermore, national education policies should integrate flexible technology adoption frameworks, allowing schools to experiment with blended learning, gamification, and AI-driven educational models (Muniandy & Abdullah, 2023). Without systemic infrastructure investment, disparities in digital learning opportunities will persist, restricting equitable access to innovative pedagogy.

In addition to infrastructure improvements, policy reforms are essential to support pedagogical transformation. Policymakers should introduce adaptive, evidence-based policies that promote curriculum flexibility, interdisciplinary

education, and skill-based assessment models (Valdés & Gutiérrez-Esteban, 2023). Institutions should be granted greater autonomy to experiment with competency-based education and formative evaluation strategies, moving beyond traditional standardized testing frameworks (Tahir et al., 2024). Additionally, providing financial incentives for schools that successfully implement innovative learning models can accelerate systemic educational reform (Llorent-Vaquero et al., 2024). Without policy-level support, institutional resistance and regulatory constraints will continue to hinder pedagogical innovation.

Lastly, community engagement is crucial in overcoming socio-cultural resistance. Schools must actively collaborate with parents, local communities, and industry leaders to build trust and awareness of the benefits of student-centered learning approaches (Herrera & Chugai, 2024). Implementing culturally responsive teaching strategies, which integrate regional educational traditions and accessibility initiatives, can help gain wider acceptance of interactive, problem-solving learning models (Llorent-Vaquero et al., 2024). Furthermore, government-led awareness campaigns and outreach programs can highlight the long-term benefits of innovative pedagogy, reinforcing its role in workforce development and 21st-century skills acquisition (Garba & Abdulhamid, 2024). By fostering community support, resistance to pedagogical transformation can be minimized, ensuring a smoother transition toward modernized, technology-driven learning environments.

To sustain pedagogical transformation, future research must explore targeted solutions tailored to specific educational contexts. Longitudinal studies should assess the long-term impact of digital literacy initiatives, AI-driven learning models, and flexible curriculum reforms on student engagement and academic performance (Valdés & Gutiérrez-Esteban, 2023). Examining best practices in technology-enhanced learning and policy-driven education reform can offer scalable recommendations for broader implementation. Additionally, research on AI-powered adaptive learning models should focus on their effectiveness in enhancing personalized education, while mitigating ethical concerns such as bias and data privacy risks (UNESCO, 2021). Furthermore, institutional strategies for overcoming policy rigidity and administrative resistance must be explored, with case studies identifying successful models of flexible, student-centered pedagogical adoption (Llorent-Vaquero et al., 2024).

Equally important is investigating the role of community engagement in supporting pedagogical innovation. Future research should examine how parental involvement, industry collaboration, and cultural adaptability influence the success of digital education models (Muniandy & Abdullah, 2023). Understanding socio-cultural variations in education reform acceptance can help shape policies that align with diverse learning environments. By focusing on these research areas, scholars can contribute to a deeper understanding of best practices in innovative pedagogy, enabling policymakers and educators to develop adaptable, scalable, and effective solutions that enhance global educational equity (Garba & Abdulhamid, 2024).

5. Limitations of the Study

This study has several limitations that should be acknowledged. As a systematic literature review, it relied on secondary sources rather than empirical investigations, limiting direct insight into real-world implementation challenges. While this method provided a broad understanding of recurring issues, it may not have fully captured context-specific variations in different educational environments. Additionally, the study adopted a generalized framework, which may have overlooked regional differences in technological infrastructure, policy execution, and socio-cultural attitudes toward innovative pedagogy.

Future research should incorporate empirical studies, including case studies and large-scale surveys, to validate these findings across diverse educational settings. Further, while various strategies are proposed to overcome barriers, their effectiveness remains largely theoretical. Longitudinal studies assessing the real-world impact of interventions, such as professional development programs, infrastructure investments, and policy reforms, are necessary to refine best practices and provide concrete recommendations for facilitating the adoption of innovative pedagogy globally.

6. Conclusion

The successful implementation of innovative pedagogy is vital in transforming education to meet the evolving demands of the 21st century. However, multiple challenges, including technological limitations, inadequate infrastructure, rigid policies, and socio-cultural resistance, continue to hinder its widespread adoption. This study has underscored the need for a comprehensive approach that integrates policy reforms, digital infrastructure improvements, continuous teacher training, and greater community engagement to ensure sustainable and equitable learning environments.

Overcoming these challenges requires collaborative efforts from educators, policymakers, and stakeholders to create adaptable and inclusive educational frameworks. Institutions must invest in professional development programs that equip teachers with the skills necessary to integrate technology and innovative teaching models effectively. Additionally, revising assessment structures to support competency-based learning and implementing governance models that promote ethical AI usage can further enhance the effectiveness of pedagogical innovations.

Moving forward, educational systems must remain flexible and responsive to technological advancements, policy shifts, and socio-cultural dynamics. Future research should explore empirical case studies and long-term evaluations of innovative pedagogy to identify scalable best practices. By addressing these challenges systematically, the education sector can foster more inclusive, student-centered, and technology-driven learning environments that prepare learners for the complexities of the modern world.

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Appendix 1: List of selective articles

Author	Purpose of Study	Key Findings (Challenges)
Ramulumo et al. (2024)	To explore challenges and opportunities in implementing flipped classrooms in science education.	Socioeconomic disparities and limited access to technology hinder student participation.
Mashishi and Ramaila (2024)	To investigate challenges in using Scratch coding tools for active learning in life sciences.	Resource limitations, lack of teacher support, and logistical issues impede effective implementation.
Almakky (2024)	To examine the integration of web-based learning in Arabic-speaking higher education contexts.	Cultural resistance, lack of institutional support, and low engagement strategies affect success.
Noor et al. (2024)	To assess teachers' competencies in using Google Classroom as an LMS in vocational education.	Insufficient training and moderate technological proficiency are barriers to effective LMS use.
Sadıç and Bavlı (2024)	To explore innovative teaching practices during emergency remote teaching.	Lack of guidance, technological infrastructure, and teacher adaptability are key challenges.
Tahir et al. (2024)	To analyze leadership roles in nurturing teacher creativity in schools.	Heavy workloads, resistance to change, and lack of resources constrain leadership support.
Devika et al. (2024)	To review challenges in transitioning from lecture-based to problem-based learning.	Teacher training, curriculum misalignment, and student readiness are barriers to implementation.
Khodamoradi (2024)	To explore barriers to implementing CLT-based curriculum innovations in Iranian schools.	Institutional constraints, cultural barriers, and teacher perceptions hinder full curriculum implementation.
Iqbal et al. (2022)	To examine challenges and opportunities in adopting augmented reality for STEM education.	Accessibility, connectivity issues, and lack of resources limit AR adoption in STEM contexts.
Georgia et al. (2024)	To analyze the potential of AI in enhancing physics education.	Teacher preparedness, resource constraints, and adaptability issues hinder effective AI use in classrooms.
Garba and Abdulhamid (2024)	To investigate institutional challenges in hybrid teaching post-pandemic.	Limited institutional support, resource disparities, and faculty engagement gaps impact hybrid teaching models.
Valdés and Gutiérrez-Esteban (2023)	To identify barriers and enablers in advancing educational innovation.	Rigid policies, lack of teacher incentives, and administrative resistance slow educational innovation.
Muniandy and Abdullah (2023)	To review gaps in pedagogical policies and their execution across contexts.	Inconsistent policy implementation and lack of standardization hinder innovative pedagogy adoption.
Basri et al. (2024)	To explore modern education management strategies for sustainable education.	Insufficient leadership strategies, lack of inclusivity, and limited digital integration are major barriers.
Achruh et al. (2024)	To investigate AI adoption challenges in Islamic higher education.	Ethical concerns, digital divide, and lack of culturally sensitive AI tools affect adoption.
Lan and Oanh (2024)	To explore reluctance among lecturers to adopt digital gamification.	Cultural and institutional resistance, coupled with resource constraints, impede digital gamification adoption.
Qassrawi et al. (2024)	To analyze the effectiveness of AI-powered applications for improving EFL student proficiency.	Technological alignment issues and communication challenges with AI tools impact effectiveness.