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ANALYSIS OF MANAGERIAL GAPS IN THE TRANSFORMATION OF THE DEEP LEARNING ECOSYSTEM IN ELEMENTARY SCHOOLS

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Abstract

In the context of twenty-first-century education, deep learning has emerged as a central paradigm that emphasizes conceptual understanding, critical thinking, and collaboration. Although it is theoretically acknowledged as a pedagogical ecosystem that requires strong managerial support, its implementation in elementary schools remains largely constrained by administrative-oriented management practices. This study aims to examine the managerial gaps that hinder the effective implementation of deep learning in elementary schools and to identify strategic requirements for its systematic strengthening. Employing an Integrative Literature Review (ILR) approach, this study synthesizes 20 selected scholarly articles published between 2020 and 2025 and sourced from the Google Scholar and ScienceDirect databases. Data were analyzed through thematic content analysis to generate a comprehensive conceptual synthesis. The findings reveal four major challenges, namely misalignment of strategic direction, limited managerial readiness, weak instructional leadership, and an underdeveloped culture of collaboration within schools. This study contributes theoretically by proposing a conceptual framework that connects managerial dimensions with the success of deep learning implementation, while also offering strategic implications for school leaders to shift from an administrative focus toward leadership practices that actively support the quality of learning.

INTRODUCTION

The development of twenty-first-century education requires elementary schools to move beyond a traditional focus on knowledge transmission toward learning practices that foster meaningful understanding, higher-order thinking skills, and students' reflective capacities. In this study, deep learning refers to the pedagogical approach proposed by Fullan, which emphasizes conceptual interconnectedness, critical thinking, collaboration, and the meaningful application of knowledge in authentic contexts. This approach intersects with the principles of meaningful learning introduced by Ausubel and higher-order learning as articulated in the revised Bloom's Taxonomy (Fitri & Kinkin, 2024; Weng et al., 2023). Although national education policies, such as the Independent Curriculum, have encouraged this transformation (Ministry of Education and Culture, 2022), the implementation of deep learning in elementary schools continues to face significant challenges. These challenges largely stem from school management strategies that have not yet been systemically integrated to support deep learning practices.

Empirical studies indicate that many schools remain heavily oriented toward administrative routines and accreditation demands, resulting in limited space for instructional innovation to develop optimally (Elia Azizah et al., 2024). Consequently, a gap emerges between contemporary educational paradigms and actual school management practices. This gap reflects a fundamental limitation in schools' capacity to manage change effectively.

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In principle, school management strategies encompassing the formulation of strategic direction, resource management, and the facilitation of instructional practices should serve as the foundation for successful deep learning implementation. However, in practice, many principals have not been able to perform a strategic role as instructional leaders, while teachers often lack sufficient reflective and collaborative professional support (Sülau et al., 2024; Venty et al., 2025).

A growing body of literature confirms that the success of deep learning is strongly influenced by a school's organizational culture, particularly one that is collaborative, supportive, and innovative (Mansyur et al, 2025). Nevertheless, recent studies also reveal that many schools continue to operate within hierarchical and control-oriented organizational structures. Under such conditions, teachers tend to be more engaged in administrative tasks than in professional development activities. This situation indicates the presence of managerial unpreparedness that is both structural and conceptual, which in turn has significant implications for the weak theoretical coherence and limited effectiveness of deep learning implementation in elementary schools.

The academic gap addressed in this study arises from the tendency of previous research to examine related issues in a fragmented manner, such as focusing solely on the role of school principals, leadership styles, or curriculum implementation. Studies that explicitly link elementary school management strategies to the comprehensive implementation of deep learning across structural, conceptual, and organizational cultural dimensions remain limited (Rozan Taqi et al., 2025). A holistic understanding of managerial complexity is therefore essential to explain why deep learning has not been implemented consistently, despite the existence of strong policy foundations.

Accordingly, this study aims to analyze the challenges faced by elementary school management strategies in implementing deep learning by tracing the root causes of these challenges across structural, conceptual, and organizational cultural dimensions. The primary focus is to identify the barriers encountered in deep learning implementation and to examine the contribution of each managerial dimension to these barriers. Through this approach, the study seeks to provide a deeper and more integrated understanding of the factors that influence the effectiveness of elementary school management strategies in supporting more meaningful and contextual learning practices.

METHODS

This study employs an Integrative Literature Review (ILR) approach designed to comprehensively synthesize both empirical and conceptual findings. ILR was selected because it allows for the integration of studies with diverse methodological designs, a process that cannot be fully accommodated by a Systematic Literature Review (SLR), which typically emphasizes homogeneous empirical synthesis. The choice of ILR is based on the nature of the research problem, namely the complexity of elementary school management strategies in the implementation of deep learning, which cannot be adequately reduced through purely statistical analysis. Through ILR, researchers are able to construct a contextual and theoretically rich understanding of managerial dynamics, instructional leadership, and school organizational culture (Creswell & Creswell, 2018).

The literature search was conducted systematically using two major academic databases, ScienceDirect and Google Scholar. These databases were selected due to their extensive coverage of reputable national and international journals in the fields of

educational management and pedagogy. The article selection process followed the PRISMA flow, which includes stages of identification, screening, eligibility assessment, and final selection. To ensure transparency and replicability, the number of articles at each stage was recorded. Inclusion criteria consisted of peer-reviewed publications published between 2020 and 2025, relevance to elementary school management and deep learning, and availability in either Indonesian or English. This process resulted in a final corpus of 20 articles for analysis.

Data analysis was conducted using thematic content analysis, which involved open coding, axial coding, and selective coding to identify and integrate thematic patterns across the selected studies. The analysis process was concluded once thematic saturation was achieved, indicated by the absence of new substantive themes emerging from additional sources. The resulting thematic synthesis was then used to develop a conceptual framework that maps the relationships among managerial readiness, instructional leadership, school organizational culture, and the successful implementation of deep learning in elementary schools. This framework is systematically presented and discussed in the results and discussion section as the primary theoretical contribution of the study.

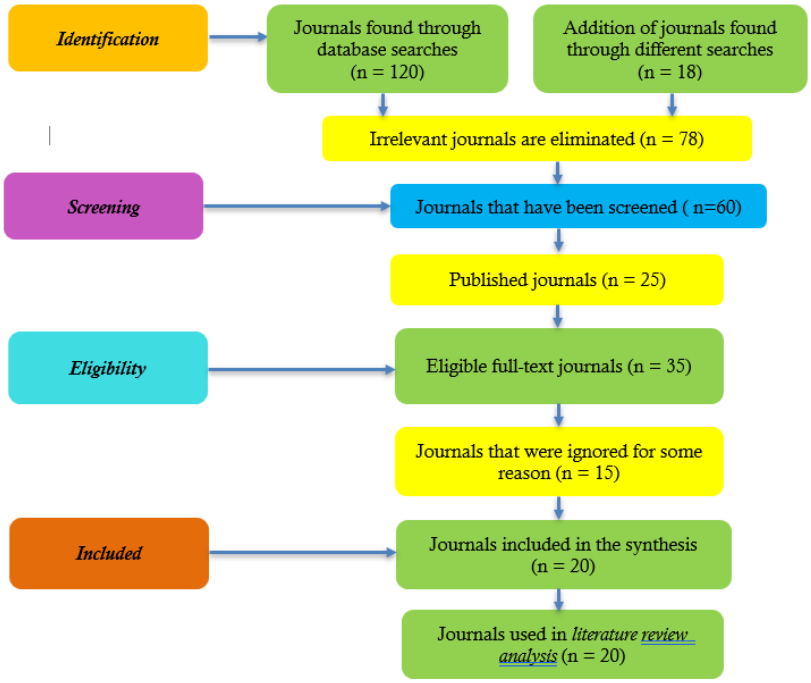

Figure 1. PRISMA Steps

RESULTS AND DISCUSSION

RESULTS

This section presents the findings of an Integrative Literature Review (ILR) examining the challenges faced by elementary school management strategies in supporting the implementation of deep learning as an interconnected managerial system. Drawing on a synthesis of seven recurring themes identified in the literature, the findings are not discussed in isolation but are systematically organized into four major managerial dimensions that reflect structural and causal relationships. These findings confirm that deep learning should not be understood merely as an outcome of school management policy; rather, it functions as a pedagogical core that shapes leadership orientation, resource management, organizational innovation, and evidence-based decision-making processes.

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The first dimension, managerial capacity and strategic leadership, encompasses issues related to leadership readiness as well as limitations in resources and infrastructure. Most studies highlight insufficient preparedness among school leaders in responding to complex and challenging situations, which directly affects the effectiveness of deep learning strategies (Lazaris, 2025; Paraskevi Chatzipanagiotou & Katsarou, 2023). Weak governance mechanisms, limited leadership competencies, and ineffective strategic communication at the elementary school level further reinforce structural barriers in managing resources that support deep learning (Mincu, 2024b). Reported constraints related to technology availability, facilities, and teacher professional development (Almayali & Almusawy, 2021; Isnayanti, Nur., Putriwanti, Kasmawati, 2025; T. Sudarmono et al., 2025). indicate that resource-related challenges are not merely technical in nature but are largely a consequence of managerial capacity that is insufficiently oriented toward deep learning.

The second dimension concerns curriculum management and deep learning implementation, focusing on schools' ability to translate deep learning principles into coherent curriculum designs and instructional practices. The literature suggests that integrating deep learning into elementary school curricula requires a shared understanding of twenty-first-century competencies, including critical thinking, collaboration, creativity, and communication (Isnayanti et al., 2025; M. A. Sudarmono et al., 2025). Cross-study synthesis reveals that schools with strong leadership and effective management are more capable of implementing deep learning consistently, whereas schools with weaker management tend to adopt normative and fragmented approaches. The absence of empirically validated curriculum models and the limited number of experimental studies further indicate the presence of a methodological gap within this dimension.

The third dimension relates to collaborative culture and organizational innovation, integrating themes of stakeholder collaboration, innovation management, and institutional adaptability. Numerous studies confirm that the active involvement of teachers, parents, and community members plays a crucial role in strengthening management-based deep learning strategies (H. H. Almayali & Almusawy, 2021b; Baxter et al., 2025; Ertem, 2024; Murugi & Mugwe, 2023a; D. Pahi et al., 2024). Collaboration is frequently positioned as a mechanism for overcoming resource limitations, particularly in schools with minimal infrastructural support. At the same time, the literature on educational innovation indicates that schools characterized by an innovation-oriented culture and strong institutional adaptability are better positioned to implement deep learning in a sustainable manner (Bou Zeid & Abouchedid, 2025; A. M. Haq et al., 2023; H. Hernawaty et al., 2025; P. Xuan Lam et al., 2024). Nevertheless, variations in research methodologies and the absence of standardized measurement instruments suggest that organizational innovation in elementary schools is not yet managed systematically.

The fourth dimension addresses evidence-based decision-making and continuous evaluation, encompassing the use of data and systematic reflection. Several studies emphasize the importance of utilizing learning assessment data, teacher performance indicators, and student needs as a foundation for strategic decision-making (Lazaris, 2025; Mikraj et al., 2025). Continuous evaluation and reflective practices are also identified as essential for maintaining the quality and sustainability of deep learning implementation (Gao, 2025; Pangesti et al., 2025). However, limited data analysis capacity, heavy administrative workloads, and weak monitoring systems often constrain the effective use of data, particularly in schools operating in resource-limited and geographically specific contexts.

Overall, the findings of this ILR suggest that the success of deep learning in elementary schools emerges from the systemic interaction of strategic leadership, curriculum management, collaborative and innovative school cultures, and evidence-based decision-making. The seven themes identified do not operate independently but instead form an integrated school management system. The novelty of this study lies in positioning deep learning as the central axis of the school managerial system, thereby distinguishing it from conventional studies of school management and reinforcing the conceptual contribution of this ILR to the development of deep learning–oriented management strategies in elementary education.

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DISCUSSION

The results of the Integrative Literature Review (ILR) indicate that managerial challenges in elementary schools are multidimensional and highly interrelated. These challenges not only reflect structural weaknesses but also reveal potential opportunities for innovation when addressed strategically. The lack of preparedness among school leaders in responding to complex and dynamic situations significantly constrains the effectiveness of deep learning strategies, as evidenced in several studies (Paraskevi Chatzipanagiotou & Katsarou, 2023). This condition is further exacerbated by weak strategic planning and ineffective communication, which often generate ambiguity in policy interpretation and implementation at the school level (Lazaris, 2025). From the perspective of classical management theory, particularly Fayol's core management functions of planning, organizing, and controlling, these weaknesses reflect suboptimal managerial practices in elementary schools, especially in managing instructional change. This interpretation is reinforced by contemporary analyses of educational management, which emphasize the growing complexity of leadership demands in modern schools (Mincu, 2024). Nevertheless, evidence from schools with stronger managerial capacity suggests that visionary leadership can mitigate these challenges, indicating that contextual variation plays a critical role in shaping outcomes.

The ILR further demonstrates that limitations in managerial capacity are closely linked to leadership readiness in navigating the complexity of educational change at the elementary level. The role of the principal has shifted from that of a mere administrator to that of an instructional leader who integrates pedagogical vision with adaptive management practices. Chatzipanagiotou & Katsarou (2023) emphasize that reactive leadership models are often inadequate for responding to the demands of deep learning, which require flexibility, reflection, and context-sensitive decision-making. Under such conditions, schools tend to become entrenched in administrative routines that constrain pedagogical innovation and professional learning.

Viewed through the lens of transformational leadership theory, weak leadership readiness reflects the absence of shared vision building, intellectual stimulation, and individualized support for teachers as key agents of learning. This reinforces the argument that managerial challenges are not merely technical in nature but are deeply embedded in the cultural and structural dimensions of school organizations. Mincu (2024) highlights that contemporary educational management requires principals to foster collective sense-making processes, enabling all school members to understand, internalize, and commit to instructional change. In this sense, visionary leadership functions as a catalyst that coherently aligns deep learning policies, strategies, and classroom practices.

The ILR also reveals that variations in school context such as size, geographic location, and socioeconomic backgroundsignificantly influence the effectiveness of managerial leadership. Schools with stronger managerial capacity demonstrate a greater ability to transform challenges into opportunities for innovation, whereas schools with limited resources often experience fragmentation between policy intentions and actual practices. These findings underscore the importance of incorporating contextual dimensions into managerial analyses, ensuring that intervention strategies are responsive rather than generic.

Another prominent challenge identified in the literature concerns limitations in infrastructure and technology. These constraints have a substantial impact on the

implementation of deep learning, which requires learning environments rich in experience, interaction, and inquiry (Almayali & Almusawy, 2021). Study Isnayanti, no. Nur., Putriwanti, Kasmawati (2025) and T. Sudarmono et al (2025) emphasize that inadequate facilities hinder the development of twenty-first-century competencies, thereby necessitating gradual and sustainable strategies for strengthening school infrastructure. However, several studies also demonstrate that schools with more mature digital ecosystems are able to creatively adapt simple technologies through pedagogical innovation, suggesting that infrastructure alone does not determine success.

Beyond physical infrastructure, the ILR highlights that technological challenges are closely associated with teachers' digital literacy and the readiness of learning support systems. Limited infrastructure is frequently compounded by teachers' insufficient capacity to integrate technology pedagogically, resulting in underutilization of available tools. Almayali & Almusawy (2021) argue that deep learning requires meaningful technology integration rather than the superficial use of digital tools as presentation media. Consequently, technological limitations should be understood as systemic issues encompassing competencies, policies, and school culture.

Findings Isnayanti et al (2025) and Sudarmono et al. (2025) Consistent with educational ecological theory, technology is conceptualized as an integral component of the learning environment that interacts dynamically with human and organizational factors. The effectiveness of technology in supporting deep learning therefore depends on alignment among school policies, teacher competencies, and student needs. The ILR emphasizes that investments in technology without parallel development of pedagogical capacity risk creating new disparities and yielding minimal impact on learning quality.

Stakeholder collaboration emerges as a critical determinant of success in implementing deep learning. Adaptive leadership models emphasize the importance of synergy among teachers, parents, and the broader community in designing meaningful learning experiences (H. H. Almayali & Almusawy, 2021b; Ertem, 2024). Empirical evidence from Murugi & Mugwe (2023) indicates that collaboration enhances shared awareness of educational needs and strengthens strategic implementation. Similarly, Pahi et al (2024) highlight the potential of artificial intelligence to enrich collaborative interactions by facilitating deeper reflection and shared analysis. These findings illustrate a clear interrelationship among themes: strong leadership fosters effective collaboration, while collaboration serves as a mechanism for addressing resource constraints and optimizing deep learning practices.

Moreover, stakeholder collaboration functions not only as external support but also as a means of strengthening internal school capacity. Effective collaboration enables knowledge exchange, value alignment, and the development of a shared commitment to learning goals. Murugi & Mugwe (2023) demonstrate that parental and community involvement increases a sense of ownership, which in turn reinforces the sustainability of innovative instructional practices.

The ILR underscores the central role of adaptive leadership in sustaining such collaborations. Principals who act as boundary spanners—linking schools with external environment are more successful in mobilizing social and cultural resources. Ertem (2024) affirms that cross-stakeholder collaboration is increasingly vital in contexts characterized by rapid change and uncertainty, where schools can no longer rely solely on internal resources.

The use of AI, as revealed by Pahi et al (2024), expanding the dimension of collaboration by providing a space for more in-depth reflective discussion and shared analysis. However, this ILR also emphasizes that the use of AI must be accompanied by a clear ethical and pedagogical framework so that collaboration is not purely instrumental. Thus, the relationship between themes further emphasizes that solid collaboration is the result of an interaction between strong leadership, the right use of technology, and an organizational culture that is open to innovation.

Innovation and adaptation management are identified as key determinants of school resilience amid ongoing change. Haq et al (2023) emphasize that innovation requires systematic planning, implementation, evaluation, and follow-up. Hernawaty et al (2025) further highlight the influence of leadership and organizational culture on teacher performance as an indicator of innovation success. Complementary findings from Bou Zeid & Abouchedid (2025); Xuan Lam et al (2024) reinforce the role of data analytics and system resilience as foundations for responsive managerial decision-making. These studies reveal a mutually reinforcing relationship in which effective data use supports innovation, and successful innovation strengthens system capacity.

Innovation management in the context of primary schools requires a systematic and sustainable approach, not just the sporadic adoption of new practices. This ILR shows that successful innovation is generally supported by a management cycle that includes strategic planning, targeted implementation, data-driven evaluation, and reflective follow-up. Haq et al (2023) emphasizing that innovation failures are often caused by weak evaluation phases and lack of organizational learning mechanisms.

Hernawaty et al (2025) adding that the organizational culture that supports pedagogical experimentation plays an important role in improving teacher performance. Schools that encourage collective reflection and learning from failure tend to be more adaptive to change. Findings Bou Zeid & Abouchedid (2025; T. Xuan Lam et al (2024) reinforcing the argument that data analytics and the resilience of education systems are the foundation for innovative decision-making that is responsive to the needs of students and teachers.

This ILR reveals the mutually reinforcing causal relationship between innovation, data, and system capacity. Effectively managed data allows for the identification of problems and innovation opportunities, while successful innovations increase the capacity of systems to meet future challenges. Thus, innovation is positioned not as an end goal, but rather as a sustainable process that strengthens the sustainability of the implementation of deep learning in elementary schools.

In this context, evidence-based decision-making emerges as a crucial link between data analysis and meaningful learning practices. Schools that adopt evidence-based approaches are better positioned to respond to challenges in a contextual and strategic manner (Lazaris, 2025; Mikraj et al., 2025). Periodic evaluation and reflective practices function as feedback mechanisms that enable continuous improvement of deep learning strategies (Gao, 2025; H. W. Pangesti et al., 2025). However, the ILR also emphasizes that data interpretation is not neutral; it is shaped by managerial capacity and the school's reflective culture. Consequently, strengthening data literacy among school leaders and teachers is a prerequisite for effective evidence-based decision making.

Evidence-based managerial decisions are the link between data analysis and meaningful learning practices. This ILR shows that schools that adopt the *evidence-based decision making* better able to respond to challenges appropriately and contextually. Lazaris (2025) emphasizing that the use of data not only improves decision accuracy, but also strengthens policy legitimacy in the eyes of teachers and stakeholders.

Periodic evaluation and reflection, as indicated by Gao (2025); R. Pangesti et al (2025), serves as a feedback mechanism that allows for continuous improvement of deep learning strategies. This ILR emphasizes that data is not neutral; The interpretation depends heavily on the managerial capacity and reflective culture of the school. Therefore, strengthening data literacy for school leaders and teachers is an important prerequisite for the success of evidence-based decisions.

This mechanism describes a dynamic cycle in which data drives innovation, innovation reinforces learning, and learning generates new data for subsequent decision-making. The cycle directly contributes to the achievement of deep learning dimensions, such as *critical thinking*, *creativity*, *metacognition*, and *inquiry*, which are the main goals of learning transformation in elementary schools.

Overall, the findings indicate that managerial challenges in elementary schools are not merely constraints but also potential catalysts for innovation when addressed through flexible, collaborative, and evidence-based management strategies. The primary contribution of this ILR lies in its integrative mapping of interrelated themes, demonstrating that the effectiveness of deep learning depends on the holistic integration of leadership, resources, innovation, and system adaptation. Conceptually, the ILR positions deep learning implementation as a non-linear and interdependent process within a complex educational ecosystem. Practically, these findings suggest that schools must adopt adaptive management strategies aligned with local contexts, while policymakers should provide structural support that enables sustainable innovation in elementary education.

Conceptually, this ILR emphasizes that the implementation of deep learning in elementary schools is a systemic process that is non-linear and interdependent. Managerial challenges, infrastructure limitations, collaborative dynamics, innovation management, and evidence-based decisions cannot be understood in isolation, but rather as part of a complex educational ecosystem. Changes in one dimension have the potential to trigger changes in another, so partial approaches tend to have limited impact.

The theoretical implication of these findings is the need for an education management framework that integrates leadership perspectives, organizational theory, and deep learning pedagogy in an integrative manner. This ILR enriches the literature by showing that the effectiveness of deep learning is largely determined by the quality of integration between school management functions. By practical implication, primary schools need to develop management strategies that are flexible, collaborative, and adaptive to local contexts, while policymakers need to provide structural support that allows schools to innovate sustainably.

CONCLUSION

The findings of this study indicate that the challenges faced by elementary schools in implementing deep learning are not merely technical in nature but are fundamentally systemic. These challenges are closely linked to misaligned strategic directions, low levels of managerial readiness, and weak leadership capacity in responding to the demands of

twenty-first-century learning. Limited conceptual understanding, underdeveloped strategic planning, and ineffective organizational communication emerge as dominant factors that inhibit the establishment of deep learning practices within schools.

These results demonstrate that the successful implementation of deep learning requires more than adaptive, evidence-based, and collaborative school management practices when considered separately. Instead, these principles operate interdependently as an integrated managerial system that directly determines the sustainability and depth of deep learning implementation in elementary schools. This interdependent relationship, which has not been explicitly articulated in previous educational management studies, highlights the need for a holistic approach to school leadership and governance. Strengthening instructional leadership, promoting transparent governance, and fostering the active involvement of all stakeholders—including teachers, parents, and the wider community—are therefore essential prerequisites for cultivating a learning environment that is reflective, innovative, and sustainable. When management strategies are implemented in an integrated and coherent manner, existing challenges can be transformed into meaningful opportunities for school development.

Future research should focus on identifying specific indicators of instructional leadership competencies that most strongly influence the success of deep learning in elementary schools, particularly in contexts characterized by limited resources. Additionally, comparative studies examining the effectiveness of evidence-based management strategies across diverse geographic and socioeconomic settings are needed to determine the most influential managerial mechanisms. Further investigation is also required to explore operational models of collaboration that effectively integrate data-driven reflection, continuous evaluation, and strategic decision-making in a sustainable manner, as this aspect remains underexplored in the current body of literature.

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Author

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All authors contributed substantially to the research and preparation of this manuscript. The first author plays a role in the conceptualization of the research, the formulation of the study design, and the preparation of the theoretical framework. The second author is responsible for literature search, article selection, and data collection through *the Integrative Literature Review* approach. The third author conducted data analysis using *thematic content analysis*, interpretation of findings, and preparation of results and discussions. All authors are involved in writing the initial draft, critical revision of the manuscript, and giving final approval to the published version. The order of the authors reflects the level of contribution of each.

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Data Availability Statement
The data used in this study came from *peer-reviewed* scientific articles that are publicly available on Google Scholar and ScienceDirect databases. A list of analyzed articles is presented in the references section. Supporting data in the form of thematic synthesis results can be obtained from the author of the correspondence upon reasonable request for academic purposes.

Declaration of Interests Statement

The authors state that there are no conflicts of interest, either financial or non-financial, that could affect the research design, data analysis, interpretation of results, or the preparation of this manuscript.

AI Use Statement

During the process of drafting this manuscript, the authors used **ChatGPT (OpenAI, GPT-5.2 version)** on a limited basis to help with language editing, sentence clarity, and academic readability. All results generated by AI-based tools have been critically reviewed, revised, and verified by the authors. The author is solely responsible for the accuracy, originality, and scientific integrity of the manuscript content.

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