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Elucidating New Model Of Artificial Intelligence As Teaching Aids In Special Education Needs: A Pedagogical Perspective

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ABSTRACT

The growing integration of artificial intelligence (AI) in education has created new possibilities for enhancing inclusive teaching and learning, particularly for students with special education needs (SEN). Despite the increasing development of AI-driven educational technologies, many existing systems remain predominantly technocentric and insufficiently aligned with pedagogical principles required for inclusive education. This conceptual paper proposes the PAISEN Model (Pedagogical Artificial Intelligence for Special Education Needs) as a theoretical framework that explains how AI can function as a pedagogically mediated teaching aid in special education contexts. Drawing on interdisciplinary literature from artificial intelligence in education, inclusive pedagogy, Universal Design for Learning (UDL), and assistive technology, the study conceptualizes a multilevel framework in which AI teaching support systems operate through teacher pedagogical mediation and inclusive learning environments to improve learning outcomes for SEN students. The model highlights the importance of teacher interpretation of AI-generated insights and the creation of accessible learning environments that accommodate diverse cognitive and communication needs. In addition, the framework recognizes the role of contextual moderating factors such as teacher AI competency, institutional support, and digital infrastructure in influencing the effectiveness of AI integration. By integrating technological innovation with pedagogical expertise, the PAISEN Model contributes to theoretical discussions on AI-supported inclusive education and provides guidance for future empirical research, educational practice, and policy development aimed at promoting equitable learning opportunities for students with special education needs.

1. Introduction

Artificial intelligence (AI) has emerged as one of the most transformative technologies shaping contemporary education systems. Over the past decade, AI-driven tools have been increasingly

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integrated into teaching and learning environments, enabling adaptive instruction, automated feedback, intelligent tutoring systems, and personalized learning pathways [68, 7]. These innovations have generated substantial interest among educators, policymakers, and technology developers seeking to improve educational outcomes and increase learning accessibility [28, 27]. In particular, the application of AI within educational contexts has been viewed as a promising mechanism for addressing diverse learner needs through data-driven personalization and real-time instructional adaptation [36].

Within the broader landscape of educational innovation, the integration of AI technologies has become particularly relevant in the context of inclusive education. Global educational agendas such as the United Nations Sustainable Development Goal 4 (SDG 4) emphasize the importance of ensuring inclusive and equitable quality education for all learners [60], including those with disabilities and special educational needs [2]. Special Education Needs (SEN) learners frequently encounter significant barriers within traditional instructional environments due to differences in cognitive processing, communication abilities, sensory perception, and social interaction [4, 53]. Consequently, there is growing recognition that emerging digital technologies, including AI, might serve as powerful tools for supporting inclusive learning environments.

In recent years, a wide range of AI-driven educational technologies have been developed to support students with learning disabilities, autism spectrum disorders, attention deficit disorders, and other special learning needs [37]. These technologies include speech recognition systems for language development, predictive text tools for writing assistance, adaptive learning platforms that adjust instructional difficulty levels, and AI-powered communication devices designed to support non-verbal learners [41, 10]. Such innovations demonstrate the potential of AI to enhance accessibility, personalize instruction, and facilitate more responsive educational experiences.

Despite these promising developments, the integration of artificial intelligence within special education remains uneven and conceptually fragmented. Much of the existing literature focuses primarily on technological capabilities rather than pedagogical integration [64, 20, 62]. In many cases, indeed, AI tools are designed from a technological perspective without sufficient consideration of how teachers actually implement instructional strategies in inclusive classrooms. As a result, many AI applications function as isolated digital tools rather than integrated components of pedagogically informed teaching practices.

Another challenge lies in the tendency for AI-driven educational technologies to adopt a technocentric approach that emphasizes automation and algorithmic optimization while overlooking the central role of teachers in facilitating meaningful learning experiences. Research has increasingly emphasized that effective inclusive education depends not only on technological support but also on teacher mediation, instructional scaffolding, and responsive pedagogical practices that adapt to individual learner needs [23, 66]. Without such pedagogical grounding, AI technologies risk reinforcing existing educational inequalities rather than addressing them.

Furthermore, SEN contexts present unique instructional challenges that cannot be fully addressed through generalized educational technologies. Students with SEN often require differentiated instruction, multimodal learning materials, and flexible teaching strategies tailored to their specific learning profiles [57]. AI technologies designed for mainstream education may therefore fail to adequately accommodate the complexity of SEN learning environments unless they are explicitly aligned with inclusive pedagogical frameworks.

Given these challenges, there is an urgent need to develop a theoretically grounded conceptual framework that integrates AI with pedagogical approaches specifically designed for special education contexts. Rather than viewing AI as an autonomous instructional system, such a framework should

conceptualize AI as a supportive teaching aid that enhances teachers' ability to provide differentiated instruction and individualized learning support.

This conceptual paper seeks to address this gap by proposing a pedagogically grounded model that elucidates the role of AI as teaching aids within special education contexts. Drawing on interdisciplinary literature from inclusive pedagogy, assistive technology, Universal Design for Learning (UDL), and artificial intelligence in education (AIED), the paper develops a conceptual model that positions AI technologies as adaptive support systems integrated within teacher-mediated instructional processes.

Thus, the primary objective of this paper is therefore to conceptualize a new pedagogical model that integrates artificial intelligence technologies with inclusive teaching strategies in special education environments. Specifically, the study aims to: (1) examine theoretical perspectives relevant to AI-supported inclusive education, (2) synthesize existing literature on AI applications in special education, and (3) propose a conceptual model that illustrates how AI can function as a pedagogically informed teaching aid in SEN learning contexts.

By advancing a pedagogically grounded framework for AI integration in special education, this study contributes to the ongoing discourse on responsible educational technology development and inclusive learning innovation. The proposed model offers theoretical guidance for educators, policymakers, and technology developers seeking to design and implement AI-supported instructional environments that promote equitable learning opportunities for students with diverse educational needs.

2. Theoretical Foundations

2.1 Inclusive Pedagogy

Inclusive pedagogy represents a foundational theoretical perspective guiding contemporary approaches to special education. The concept emphasizes that all learners, regardless of ability or disability, should have equitable opportunities to participate in meaningful educational experiences [12, 43]. Rather than segregating learners with disabilities into specialized instructional settings, inclusive pedagogy promotes teaching strategies that accommodate diverse learning needs within shared learning environments [31].

Indeed, inclusive pedagogy is grounded in the belief that diversity should be recognized as a normal and valuable aspect of educational communities [31]. Teachers are therefore encouraged to design learning activities that are accessible and engaging for all students, while also providing targeted support for learners who require additional assistance. This perspective shifts the focus from identifying student deficits to adapting instructional practices that accommodate diverse learner characteristics [43].

One key principle of inclusive pedagogy is the idea of "teaching for all." This approach encourages educators to develop instructional strategies that are sufficiently flexible to support a wide range of learners without relying solely on individualized interventions [31]. In practice, this involves using multimodal teaching materials, differentiated instruction, collaborative learning activities, and adaptive assessment methods [44].

In the context of AI integration, inclusive pedagogy highlights the importance of designing technologies that support rather than replace teacher-led instructional processes. AI systems can assist teachers by analyzing learner data, identifying learning challenges, and suggesting instructional adjustments [34]. However, the ultimate responsibility for interpreting these insights and implementing pedagogical decisions remains with educators.

2.2 Universal Design for Learning (UDL)

Universal Design for Learning (UDL) provides an important theoretical foundation for integrating AI technologies in SEN. UDL is an educational framework that emphasizes the proactive design of learning environments that are accessible and inclusive for all learners from the beginning of the instructional process [58]. Rather than modifying lessons after barriers arise [25], UDL encourages educators to anticipate learner diversity and design instructional strategies that accommodate different abilities, learning preferences, and cognitive profiles [50]. This approach is particularly relevant in special education, where students often require flexible and accessible learning environments that support their unique learning needs.

The UDL framework is structured around three core principles that guide inclusive instructional design [50, 13, 58, 63]. The first principle, multiple means of representation, focuses on presenting information in different formats so that learners can access content in ways that suit their cognitive and sensory abilities. The second principle, multiple means of engagement, emphasizes the importance of motivating learners through varied instructional strategies that sustain interest and participation. The third principle, multiple means of action and expression, encourages educators to provide diverse opportunities for students to demonstrate their understanding and learning outcomes.

In fact, AI technologies have significant potential to enhance the implementation of UDL principles within special education contexts. AI-powered educational systems dynamically adapt learning materials according to individual student needs and learning progress [36]. For example, adaptive learning platforms automatically adjust reading levels, convert written content into speech, generate visual explanations for complex concepts, and recommend personalized learning exercises based on student performance data [29].

Eventually, by integrating AI capabilities with UDL principles, educators can create more flexible and responsive learning environments that support diverse learner needs. Such integration allows instructional materials and learning activities to be continuously adapted to students' cognitive profiles, communication abilities, and learning preferences, thereby promoting greater accessibility and participation for students with disabilities [59].

3. Literature Review: Ai In Special Education

3.1 AI in Education: Emerging Opportunities

AI has increasingly transformed the educational landscape by enabling adaptive learning systems, intelligent tutoring platforms, and advanced data analytics capable of personalizing learning experiences [28]. AI technologies allow educational systems to process large volumes of learner data, identify learning patterns, and generate individualized instructional recommendations [27]. As a result, AI has been widely recognized as a powerful tool for enhancing teaching effectiveness and improving student learning outcomes.

In recent years, educational researchers have emphasized the potential of AI in supporting differentiated instruction and personalized learning pathways. AI-powered educational platforms with dynamism frequently fine-tune learning content based on students' performance, cognitive profiles, and learning preferences [15]. These adaptive systems provide immediate feedback and targeted learning resources, thereby facilitating more individualized learning experiences [42].

Within the broader field of educational innovation, AI has also been associated with the development of intelligent tutoring systems, automated assessment tools, predictive learning analytics, and natural language processing technologies [18]. These tools enable educators to

monitor student progress more effectively and provide timely interventions when learning difficulties are detected [49]. Such capabilities are particularly relevant in educational settings where learners require specialized instructional support, including students with SEN.

However, despite the rapid growth of AI in education, scholars have cautioned that technological innovation alone does not guarantee improved learning outcomes [11]. Effective integration of AI technologies requires alignment with pedagogical principles, teacher expertise, and inclusive instructional practices [69]. Without such pedagogical integration, this study believes that AI tools may function merely as technological add-ons rather than meaningful educational interventions.

3.2 AI Applications in SEN

The application of AI in SEN has gained increasing attention due to its potential to address diverse learner needs. Students with special education needs often experience challenges in traditional classroom environments due to cognitive differences, communication barriers or sensory processing difficulties [46]. Thus, AI technologies offer promising solutions for supporting these learners through personalized and accessible learning systems.

Indeed, several studies have highlighted the role of AI-powered assistive technologies in supporting learners with disabilities. For example, speech recognition systems assist students with language impairments by converting spoken language into text and providing real-time feedback on pronunciation and vocabulary usage [38]. Similarly, text-to-speech and speech-to-text technologies can help students with dyslexia or visual impairments access written content more effectively [56].

AI-driven learning analytics systems also play a significant role in identifying learning patterns among students with disabilities. By analyzing behavioral and performance data, AI systems can detect early signs of learning difficulties and recommend targeted instructional interventions [48]. These predictive capabilities enable educators to provide timely support and prevent learning gaps from widening over time [51].

Furthermore, AI has been increasingly applied in the development of intelligent tutoring systems designed for students with autism spectrum disorder (ASD) [39]. These systems support social communication training, emotion recognition, and behavioral development through interactive simulations and adaptive learning environments [65]. Such technologies demonstrate the potential of AI to create personalized learning experiences tailored to the unique needs of individual learners.

Despite these promising developments, the implementation of AI in SEN remains uneven across educational contexts. In many cases, AI technologies are introduced as isolated tools rather than integrated components of inclusive teaching practices. This limitation highlights the need for conceptual frameworks that guide the pedagogical integration of AI technologies within special education environments.

3.3 Assistive Technology and AI-Supported Learning

Assistive technology has long played an essential role in supporting students with disabilities by enhancing accessibility and facilitating participation in learning activities. Traditional assistive technologies include screen readers, communication devices, visual aids, and adaptive input tools designed to accommodate specific learning needs [52].

The integration of AI into assistive technology has significantly expanded the capabilities of these tools. AI-enabled assistive technologies now adapt dynamically to learner behavior, analyze interaction patterns, and provide real-time learning support [32]. For instance, AI-based reading tools

can identify words that learners struggle with and automatically adjust reading materials to match the learner's proficiency level [8].

Another important development involves AI-powered communication tools designed for students with speech or language difficulties. These systems use natural language processing algorithms to interpret user input and generate meaningful responses, enabling students to communicate more effectively with teachers and peers [70].

AI-supported assistive technologies also contribute to the development of more inclusive classroom environments by reducing barriers to participation. For example, AI-driven captioning systems can provide real-time subtitles during classroom lectures, enabling students with hearing impairments to follow instructional content more easily [5]. Similarly, AI-based visual recognition tools can assist visually impaired students by describing visual information in digital learning materials [21].

Nevertheless, while AI-enhanced assistive technologies offer significant advantages, their effectiveness largely depends on how they are integrated into teaching practices. Research suggests that assistive technologies are most effective when combined with teacher-guided instructional strategies and inclusive learning environments [37]. This observation reinforces the importance of teacher mediation in AI-supported educational systems.

3.4 Pedagogical Challenges in Integrating AI in SEN

Despite the growing interest in AI-driven educational technologies, several pedagogical challenges continue to limit their effective implementation in SEN settings. One of the most significant challenges relates to the limited pedagogical alignment between AI technologies and inclusive teaching practices [45].

However, many AI systems are developed from a technological perspective, focusing primarily on algorithmic efficiency, automation, and data processing capabilities [33]. While AI features enhance learning analytics and adaptive content delivery, it often overlooks the complex pedagogical processes involved in supporting students with special education needs [19, 22].

Another challenge concerns teacher readiness and digital competence [72]. Successful integration of AI technologies requires teachers to possess not only technological skills but also pedagogical knowledge that enables them to interpret AI-generated insights and apply them within inclusive instructional contexts [9]. However, many educators report limited training in the utilization of AI technologies for SEN, which can hinder effective implementation [27].

Ethical considerations also represent an important challenge in the utilization of AI in SEN. AI systems often rely on large datasets to generate predictive insights, raising concerns about data privacy, algorithmic bias, and equitable access to technology [24]. Students with disabilities may be particularly vulnerable to algorithmic misinterpretation if AI systems are not designed with sufficient sensitivity to diverse learning profiles [71].

Furthermore, overreliance on automated technologies may reduce opportunities for meaningful human interaction in the learning process [1]. SEN emphasizes the importance of social relationships, teacher support and collaborative learning experiences [3]. AI technologies must therefore be carefully designed to complement rather than replace these essential pedagogical elements.

4. Conceptual Model Development: The Paisen Model

This study develops the PAISEN Model (Pedagogical Artificial Intelligence for Special Education Needs) as a conceptual framework explaining how AI function as a pedagogically grounded teaching

aid within inclusive education contexts. Building on insights from the literature on AI in education (AIED), inclusive pedagogy, Universal Design for Learning (UDL), assistive technology, the model integrates technological capabilities with teacher-mediated instructional processes to enhance learning outcomes for students with SEN. While previous studies have highlighted the potential of AI technologies to support personalized learning and adaptive instruction, the pedagogical mechanisms through which these technologies influence inclusive teaching practices remain insufficiently conceptualized. The PAISEN Model addresses this limitation by positioning teacher mediation and inclusive learning environments as key mechanisms through which AI technologies translate into meaningful educational outcomes. Rather than conceptualizing AI as an autonomous instructional system, the model emphasizes the complementary relationship between technological innovation and human pedagogical expertise.

4.1 Conceptual Foundations of the PAISEN Model

The PAISEN Model is grounded in the premise that AI should serve as an instructional augmentation tool that enhances teachers' ability to support diverse learners. This perspective aligns with contemporary views in educational technology research that emphasize the importance of maintaining teacher agency in technologically mediated learning environments [27]. Indeed, AI technologies generate valuable insights into student learning patterns [61], but the interpretation and pedagogical application of these insights ultimately depend on teacher expertise [37]. The model therefore integrates four major theoretical perspectives. First, the AI in Education (AIED) framework highlights the potential of AI technologies to enable adaptive learning, intelligent tutoring and predictive analytics that support personalized learning pathways. Second, inclusive pedagogy theory emphasizes the need for teaching practices that accommodate learner diversity and ensure equitable participation in learning activities. Third, Universal Design for Learning (UDL) provides a pedagogical framework for designing accessible learning environments that offer multiple means of engagement, representation and expression. Finally, assistive technology theory contributes insights into how digital tools can reduce barriers to learning for SEN students. By synthesizing these perspectives, the PAISEN Model conceptualizes AI as a pedagogically embedded support system that operates through teacher-mediated instructional processes and inclusive learning environments to improve learning outcomes for SEN students.

4.2 AI Teaching Support Systems

At the core of the PAISEN Model is the construct of AI Teaching Support Systems, which represents the technological foundation of the framework. These systems include a range of AI-enabled educational tools designed to support teaching and learning processes. Examples include adaptive learning platforms that adjust instructional content according to student performance [10], speech recognition technologies that facilitate language development [17], intelligent tutoring systems that provide personalized guidance [20] and learning analytics platforms that identify patterns in student learning behavior [40]. Such technologies generate real-time insights that enable teachers to better understand individual learner needs. For instance, adaptive learning systems might detect when a student is struggling with a particular concept and automatically recommend additional practice activities or alternative instructional explanations [32]. Similarly, learning analytics systems analyze patterns of student engagement and identify early indicators of learning difficulties [30]. Though, within the PAISEN Model, AI technologies are not viewed as direct determinants of learning outcomes. Instead, their primary function is to provide instructional support

that enhances teachers' ability to implement inclusive teaching strategies. The model therefore treats AI teaching support systems as enabling mechanisms that facilitate more responsive and data-informed pedagogical decision-making.

4.3 Teacher Pedagogical Mediation

A central component of the PAISEN Model is Teacher Pedagogical Mediation, which represents the first mediating mechanism through which AI technologies influence learning outcomes. Teachers play a critical role in interpreting AI-generated data and translating technological insights into instructional actions. This process involves several pedagogical practices, including instructional scaffolding, differentiated instruction, adaptive feedback and inclusive teaching strategies. Instructional scaffolding involves providing structured guidance that supports students as they develop new skills and knowledge [14]. AI technologies might assist this process by identifying the specific areas where students require additional support [37]. Teachers then design targeted instructional interventions that address these learning challenges. Further, differentiated instruction represents another important dimension of teacher mediation. Students with SEN often exhibit diverse cognitive profiles, learning preferences, and communication abilities [16]. Teachers must therefore adapt instructional strategies to accommodate these differences. AI-generated learning analytics can help teachers identify individual learning patterns and adjust instructional approaches accordingly [26]. Adaptive feedback is also an important component of pedagogical mediation. AI systems can generate immediate feedback on student performance [67], but teachers remain responsible for contextualizing this feedback and providing meaningful guidance that supports student learning [55]. Through this process, teachers transform technological data into personalized instructional support. Ultimately, the PAISEN Model thus emphasizes that AI technologies enhance teaching effectiveness primarily through teacher-mediated pedagogical processes. Without teacher interpretation and instructional adaptation, AI-generated insights may have limited educational impact.

4.4 Inclusive Learning Environment

The second mediating component of the PAISEN Model is the Inclusive Learning Environment, which represents the pedagogical context within which AI-supported teaching occurs. Inclusive learning environments are characterized by accessibility, flexibility, and responsiveness to learner diversity [22]. They are designed to ensure that all students, regardless of their abilities or disabilities, have equitable opportunities to participate in learning activities [3]. Within the PAISEN framework, inclusive learning environments are shaped by principles derived from Universal Design for Learning [13]. These principles encourage educators to provide multiple means of representation, engagement, and expression in instructional design [50]. For example, learning materials may be presented through a combination of visual, auditory, and interactive formats to accommodate diverse sensory and cognitive preferences [63]. In this context, AI technologies contribute to the development of inclusive learning environments by enabling dynamic adaptation of learning materials [67]. AI-powered systems also convert text into speech, generate visual explanations of complex concepts [17], and customize learning activities according to individual student needs [70]. These capabilities help reduce barriers to learning and increase accessibility for students with SEN. In addition to accessibility, inclusive learning environments emphasize learner engagement and participation [25]. AI-supported learning platforms incorporate interactive elements such as gamified learning tasks, adaptive quizzes, and collaborative learning activities that encourage active student

involvement [30]. Such features are particularly valuable for students with special education needs who may require additional motivation and support to remain engaged in learning activities [58]. Eventually, by facilitating the creation of flexible and responsive learning environments, AI technologies help educators implement inclusive pedagogical practices that address the diverse needs of SEN students.

4.5 SEN Student Learning Outcomes

The ultimate objective of the PAISEN Model is to enhance learning outcomes for students with SEN. These outcomes include improvements in several dimensions of learning and development. First, AI-supported inclusive teaching practices can increase student engagement, as adaptive learning activities and personalized feedback encourage active participation in the learning process. Second, AI-supported instructional strategies can contribute to cognitive development by providing targeted practice activities that reinforce conceptual understanding. Adaptive learning systems allow students to progress at their own pace, reducing frustration and enabling more effective mastery of academic content. Third, AI-enabled assistive technologies can improve communication skills, particularly for students with speech or language impairments. Speech recognition systems, text-to-speech tools, and communication applications can help students express their ideas more effectively and participate more actively in classroom discussions. Finally, the combination of AI-supported instruction and inclusive learning environments can lead to improved academic achievement and increased learning independence among SEN students. By providing personalized learning pathways and continuous feedback, AI technologies support the development of self-regulated learning skills that enable students to take greater ownership of their learning processes.

4.6 Moderating Variables in the PAISEN Model

The PAISEN Model also recognizes the influence of contextual and learner-specific moderating variables that may affect the strength of relationships within the framework. At the institutional level, factors such as teacher AI competency, school leadership support and digital infrastructure significantly influence the effectiveness of AI integration in teaching practices. Teachers who possess higher levels of technological and pedagogical competence are more likely to implement AI-supported instructional strategies effectively [54]. At the student level, characteristics such as the type of disability, cognitive learning profile and learning readiness may influence how learners respond to AI-supported instructional environments [6]. Students with different disabilities may benefit from different types of AI technologies, highlighting the importance of personalized instructional approaches [35].

4.7 Feedback and Adaptive Learning Loop

A distinctive feature of the PAISEN Model is the inclusion of a feedback and adaptive learning loop that reflects the dynamic nature of AI-supported education. AI learning analytics continuously collect data on student performance and engagement [9]. These insights inform teacher reflection and enable educators to refine instructional strategies in response to evolving learner needs. Through this iterative process, teaching practices become increasingly responsive and adaptive over time. The feedback loop therefore reinforces the ongoing interaction between technology, pedagogy and student learning outcomes [18].

4.8 Summary of the PAISEN Model

In summary, the PAISEN Model proposes a multilevel conceptual framework in which AI functions as a pedagogically integrated teaching aid that supports inclusive education. AI technologies provide instructional insights that inform teacher pedagogical mediation, which in turn contributes to the development of inclusive learning environments. These environments ultimately facilitate improved learning outcomes for students with SEN. By integrating technological innovation with pedagogical expertise, the PAISEN Model offers a comprehensive framework for understanding how AI might support inclusive teaching and learning practices in special education contexts. **Figure 1** presents the proposed PAISEN Model (Pedagogical AI for SEN), which conceptualizes how AI might function as a pedagogically mediated teaching aid within SEN contexts.

The model illustrates a multilevel framework in which AI technologies support inclusive teaching practices through a sequence of interconnected mechanisms involving teacher mediation, learning environments and student outcomes. At the top of the framework are contextual moderating variables, including teacher AI competency, institutional support and digital infrastructure. These factors shape the extent to which AI technologies effectively integrated into classroom practice. In environments with strong technological infrastructure and adequate teacher preparedness, AI tools are more likely to be implemented in pedagogically meaningful ways. The model positions Artificial Intelligence Teaching Support Systems as the primary enabling mechanism for instructional innovation. These systems include adaptive learning platforms, speech recognition technologies, intelligent tutoring systems and learning analytics tools. Such technologies generate real-time insights into learner performance and provide personalized instructional recommendations. However, the framework emphasizes that the influence of AI on learning outcomes is not direct. Instead, AI operates through the mediating role of teacher pedagogical mediation, where educators interpret AI-generated data and implement strategies such as instructional scaffolding, differentiated instruction, and adaptive feedback. Through this process, teachers transform technological insights into inclusive teaching practices. Teacher mediation subsequently contributes to the development of an inclusive learning environment grounded in principles of UDL, accessibility tools and multimodal instructional strategies. These environments provide flexible learning pathways that accommodate the diverse cognitive and communication needs of students with SEN. The model ultimately leads to SEN student learning outcomes, including improved engagement, cognitive development, communication skills and academic achievement. Additionally, student-level moderating variables, such as disability type, cognitive profile and learning readiness, influence the strength of these relationships. Finally, the model incorporates a feedback and adaptive learning loop, where AI learning analytics inform teacher reflection and continuous instructional adjustments. This iterative process ensures that teaching strategies remain responsive to evolving learner needs, reinforcing the dynamic interaction between technology, pedagogy and inclusive education.

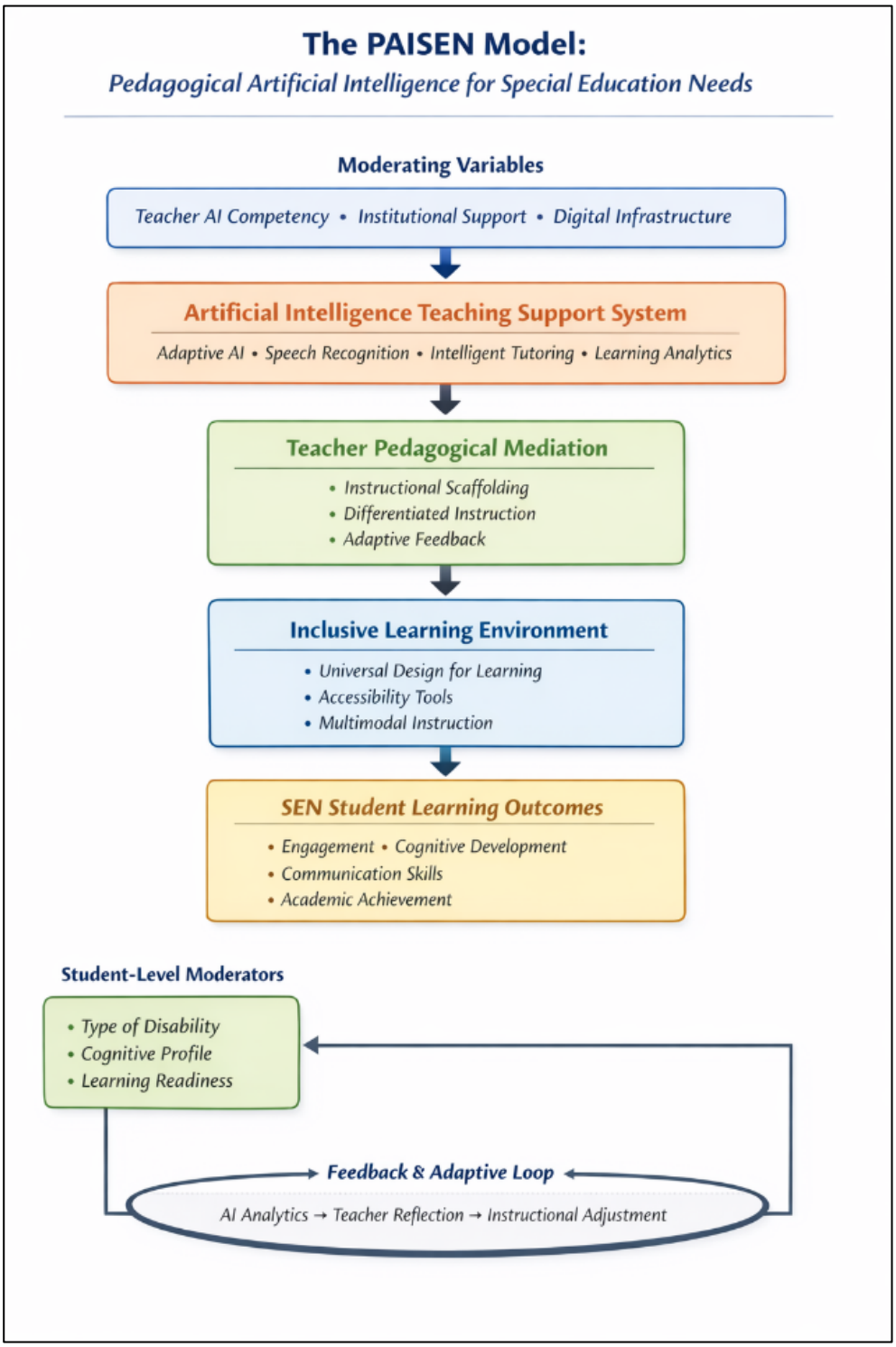

Fig. 1. The PAISEN (Pedagogy + AI + SEN) Model

5. Implications For Practice And Policy

The PAISEN Model emphasizes teacher-mediated AI use in SEN, highlighting AI literacy, inclusive pedagogy, and data-informed instruction to support adaptive, differentiated learning and effective educational policy implementation. The model advocates AI as assistive tools, not replacements, emphasizing accessibility technologies and integration with UDL to create flexible, inclusive

environments supporting diverse cognitive, communication and sensory needs of SEN learners. From a policy perspective, educational authorities must establish supportive infrastructures that enable effective AI integration in inclusive education. This includes investment in digital infrastructure, accessible educational technologies and teacher training programs that promote responsible and ethical utilization of AI in classrooms. Policymakers should also develop regulatory guidelines to address issues related to data privacy, algorithmic bias and equitable access to AI-driven educational technologies, ensuring that vulnerable learner populations are protected. Furthermore, national education systems should encourage collaborative partnerships between educators, technology developers and researchers to design AI tools that align with pedagogical objectives and inclusive education principles. By fostering such interdisciplinary collaboration, policymakers can ensure that technological innovation supports rather than disrupts existing teaching practices. Ultimately, the PAISEN Model underscores the importance of aligning technological innovation with pedagogical expertise and institutional support. When implemented strategically, AI-supported teaching systems can significantly enhance inclusive education and improve learning opportunities for students with special education needs.

6. Contributions To Theory

The PAISEN Model advances theory by framing AI as pedagogically mediated support, integrating technology with inclusive education, and emphasizing teacher interpretation of AI insights as central to meaningful instructional effectiveness. First, the model contributes to the Artificial Intelligence in Education (AIED) literature by proposing a framework that highlights the mediating role of teacher pedagogy in translating AI capabilities into meaningful learning outcomes. This perspective challenges technocentric approaches that assume AI technologies independently improve learning. Second, the PAISEN Model advances inclusive education theory by demonstrating how AI-supported tools can facilitate differentiated instruction and accessibility within UDL environments. By integrating AI with inclusive pedagogy, the model provides a conceptual bridge between technological systems and learner diversity. Finally, the framework contributes to the broader discourse on assistive educational technologies by conceptualizing AI as an adaptive support mechanism that enhances teacher capacity to address the diverse cognitive and communication needs of students with special education needs.

7. Future Research Directions

Future research should empirically examine the PAISEN Model using quantitative, qualitative or mixed methods to examine AI-supported teaching, pedagogical mediation, inclusive environments, and impacts on learning outcomes for SEN students. Longitudinal research is also needed to explore the long-term impact of AI-supported teaching practices on student engagement, cognitive development, and learning independence. Tracking learners over extended periods would provide deeper insights into how sustained exposure to AI-assisted instructional environments shapes educational progress among diverse learner populations. In addition, future studies should examine the role of moderating variables identified in the PAISEN Model, including teacher AI competency, institutional support and digital infrastructure. Understanding how these contextual factors influence the effectiveness of AI integration might inform strategies for improving teacher training and educational policy development. Finally, interdisciplinary collaboration between educators, technology developers, and educational researchers is essential for designing AI tools that align with inclusive pedagogical principles. Future research should therefore focus on developing and

evaluating AI-driven assistive technologies specifically tailored to the diverse cognitive, communication, and behavioral needs of SEN learners.

8. Conclusion

The rapid advancement of AI has moulded new opportunities to enhance inclusive education, particularly for students with SEN. This study introduced the PAISEN Model (Pedagogical Artificial Intelligence for Special Education Needs) as a conceptual framework that integrates AI technologies with teacher-mediated pedagogical practices to support inclusive learning environments. The model highlights that AI should function as a teaching support system rather than a replacement for educators, emphasizing the central role of teacher pedagogical mediation in translating AI-generated insights into effective instructional strategies. By incorporating principles of inclusive pedagogy, UDL and assistive technology, the PAISEN Model demonstrates how AI-supported instructional systems can contribute to improved student engagement, cognitive development and communication skills among SEN learners. The framework also acknowledges the influence of contextual factors such as teacher competency, institutional support and technological infrastructure in shaping successful AI integration. Eventually, the model provides a foundation for future research and practice aimed at developing pedagogically aligned AI innovations that promote equitable learning opportunities for all students.

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