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ARTIFICIAL INTELLIGENCE FOR PERSONALIZED LEARNING IN SPECIAL EDUCATION CLASSROOMS

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ABSTRACT

Artificial intelligence (AI) is increasingly being explored as a means of improving personalized learning and educational accessibility for students with special educational needs. Traditional classroom approaches may not adequately address differences in learning pace, communication abilities, cognitive development, sensory preferences, and academic performance. AI-powered educational tools, including intelligent tutoring systems, adaptive learning platforms, speech-to-text applications, text-to-speech software, and generative AI assistants, offer opportunities to provide individualized instructional materials and immediate feedback. This paper examines the potential contribution of AI to personalized learning in special education classrooms through a literature-based review of recent research published in 2025 and 2026. The review focuses on personalization, accessibility, student engagement, teacher support, ethical considerations, and implementation barriers. Recent literature suggests that AI may support differentiated instruction, improve access to educational resources, and help teachers identify individual learning needs. However, the evidence also highlights concerns regarding data privacy, algorithmic bias, unequal access to technology, inaccurate AI-generated content, and insufficient teacher training. Furthermore, the effectiveness of AI-based interventions varies across student populations and educational contexts. The paper argues that AI should complement, rather than replace, professional teaching, individualized educational planning, and human interaction. Responsible implementation requires accessible technologies, teacher supervision, appropriate institutional policies, and systematic evaluation of student outcomes. The review concludes that AI has meaningful potential to strengthen personalized special education, but its long-term educational value depends on evidence-based implementation and the protection of students' rights.

KEYWORDS: *Artificial Intelligence; Personalized Learning; Special Education; Adaptive Learning; Students with Disabilities; Assistive Technology; Inclusive Education; Educational Accessibility; Generative AI; Individualized Instruction.*

INTRODUCTION

Education systems increasingly recognize that students differ in their academic abilities, communication needs, learning preferences, interests, and rates of progress. These differences are particularly important in special education, where students may require individualized instructional strategies and additional support to participate effectively in classroom activities. Students with dyslexia, dyscalculia, autism, attention-deficit/hyperactivity disorder, hearing impairments, visual impairments, and other disabilities may experience barriers when educational materials and teaching methods are designed around a single learning approach.Personalized learning seeks to address these differences by adapting instructional content, learning activities, assessment methods, and feedback to individual requirements. Artificial intelligence offers new possibilities for supporting this process. Voultsiou, E., & Moussiades, L. (2025). found that AI-powered platforms can analyze learning interactions, identify patterns in student performance, recommend appropriate activities, and adjust task difficulty according to demonstrated progress. Generative AI can also assist in simplifying written material, producing alternative explanations, developing practice exercises, and supporting communication.Recent research has increasingly examined the relationship between AI, personalized learning, and special education. Farhood et al. (2025) reviewed AI-based personalized learning across educational settings, while Voultsiou and Moussiades (2025) examined AI, virtual reality, and large language models in special education. Other

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recent reviews have focused specifically on learning disabilities, inclusive education, and the emerging use of generative AI among neurodivergent students.Despite these opportunities, introducing AI into special education does not automatically guarantee better educational outcomes. AI-generated explanations may contain errors, automated systems may misinterpret student performance, and some tools may not be accessible to students with particular disabilities.

Privacy concerns become especially important when platforms process sensitive educational or disability-related information. Paglialunga, A., & Melogno, S. (2025). Explained thatAdditionally, schools may face limitations involving funding, internet connectivity, suitable devices, and teacher training.The central issue is therefore not simply whether AI can be used in special education, but how it can be implemented responsibly to support individual learning requirements. This paper examines the potential benefits, practical applications, limitations, and ethical implications of AI-based personalized learning in special education classrooms. For example, a teacher may use an AI assistant to prepare three versions of a reading activity with different levels of language complexity. The teacher can then review the materials, verify their accuracy, and select the version appropriate for each learner. Similarly, AI-generated practice questions can provide additional opportunities for learning, while teacher observation helps determine whether the For students with dyslexia, text-to-speech applications may make written materials easier to access, while speech-to-text systems can reduce some barriers associated with written expression. Adaptive reading platforms may offer vocabulary assistance, adjustable text presentation, and practice activities based on a student's performance. Students experiencing mathematical difficulties may benefit from step-by-step explanations, visual representations, and exercises that gradually increase in complexity.

RESEARCH OBJECTIVE

1. To examine how artificial intelligence can support personalized learning, educational accessibility, and learning engagement among students with special educational needs, while identifying the major challenges associated with its implementation in special education classrooms.

RESEARCH QUESTION

1. How can artificial intelligence support personalized learning and educational accessibility for students with special educational needs in special education classrooms?

LITERATURE REVIEW

Personalized learning involves adapting educational experiences to the abilities, requirements, and progress of individual students. Instead of expecting every learner to complete identical tasks at the same speed, personalized approaches allow instructional materials, learning activities, and feedback to respond to differences among learners. AI can contribute to this process by processing learning data and generating recommendations based on student performance.AI-based personalized learning systems can identify recurring errors, estimate the difficulty of learning tasks, and recommend suitable educational resources. For

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example, a student who struggles with reading comprehension may receive shorter passages, vocabulary explanations, audio support, and additional practice. Li, J., Yan, Y., & Zeng, X. (2025). revealed that Another student who demonstrates strong understanding may be offered more advanced activities. Such flexibility can help teachers address diverse educational requirements within the same classroom.Farhood et al. (2025), in their systematic literature review of 125 studies, examined the applications and effects of AI-based personalized learning across educational settings. Their review organized applications into areas including content recommendation, tutoring and support, and feedback and assessment. These categories are relevant to special education because students may need different levels of explanation, repetition, and instructional guidance Hariyanto et al. (2025) also examined AI techniques for adaptive education, emphasizing the importance of matching educational experiences to learner needs. However, personalization should not be understood as allowing an algorithm to make every instructional decision. Student performance can be influenced by fatigue, anxiety, inaccessible interfaces, environmental distractions, or unfamiliarity with technology. AI recommendations therefore require interpretation by qualified teachers.In special education, effective personalization should combine AI-generated suggestions with individualized educational goals, professional judgment, and knowledge of the student's strengths. AI may increase the range of instructional options available to teachers, but the quality of personalization depends on the relevance, accuracy, and accessibility of the recommended materials.Students with learning disabilities may experience difficulties in reading, spelling, writing, mathematical reasoning, working memory, or information processing. Traditional instruction may not always provide sufficient opportunities for individualized practice and timely feedback. AI-based tools can potentially address these challenges through adaptive exercises, automated feedback, speech recognition, text conversion, and interactive tutoring.

A 2025 systematic review by Melogno and colleagues' research group on AI-based interventions for students with learning disabilities reported promising outcomes across the included studies. The review nevertheless identified methodological weaknesses and concerns about the risk of bias. Positive results from individual studies should therefore not be interpreted as conclusive evidence that all AI interventions are effective for all students.Research on AI-assisted dyslexia support published in 2026 also emphasizes that AI applications are being explored for identification, assistive support, and personalized learning. However, the evidence remains fragmented, and further evaluation is needed to determine which interventions are effective in real educational settings.These findings indicate that AI should be selected according to a student's specific learning requirements rather than applied as a universal solution. Teachers should assess whether a tool improves comprehension, independence, participation, or academic performance, instead of assuming that frequent technology use necessarily represents meaningful learning progress.Neurodivergent students may have different patterns of attention, communication, sensory processing, social interaction, and information organization. These differences do not necessarily imply an inability to learn; rather, they may require alternative instructional approaches and more flexible learning environments. AI may support inclusion by allowing teachers to offer multiple ways of accessing and expressing knowledge.Generative AI systems can potentially simplify complex instructions, create examples related to students' interests, reorganize information into manageable steps, and provide additional practice. For example, a student who finds lengthy instructions difficult to process may benefit from a

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short sequence of clearly separated steps. A learner who benefits from visual organization may use structured summaries or diagrams alongside written explanations.

The 2025 review by Voultsiou and Moussiades highlights the potential of AI and immersive technologies to support educational participation and individualized learning among students with special educational needs and disabilities. The 2025 systematic review of AI and inclusive education by other researchers also identifies accessibility and personalization as important areas of development.Nevertheless, assistive tools vary in quality. Automated captions may misrepresent speech, image descriptions may overlook essential information, and simplified text may remove concepts that students need to understand. Tools may also perform differently across languages, accents, communication styles, and cultural contexts. These limitations are particularly important in multilingual classrooms.Accessibility should therefore be evaluated through actual student experiences rather than technical specifications alone. Teachers should check whether a tool enables students to complete learning tasks more independently, understand course content, and participate in classroom discussions. Schools should also provide alternative methods when AI tools are unavailable, unsuitable, or inaccurate. AI should expand access to education without creating new forms of exclusion.Teachers remain central to effective special education because they interpret individual needs, establish learning objectives, monitor progress, coordinate with families, and provide social and emotional support. AI may assist these responsibilities by preparing differentiated materials, generating practice questions, organizing formative assessment information, and suggesting alternative explanations.

METHODOLOGY

This study uses a literature-based research methodology to examine the role of artificial intelligence in personalized learning for students with special educational needs. The approach involves identifying, reviewing, and synthesizing recent scholarly publications on AI-supported instruction, adaptive learning, assistive technologies, and inclusive education.A qualitative narrative literature review design is adopted. This design is appropriate because the study aims to understand the educational applications, opportunities, challenges, and ethical implications of AI rather than test a particular intervention with a new group of students.The review focuses on peer-reviewed journal articles published in 2025 and 2026. Relevant publications are identified through academic search resources and journal platforms, including ERIC, Scopus, Web of Science, Google Scholar, Springer Nature, and ScienceDirect.The search strategy is designed to identify literature addressing the research question, with particular attention to studies published during 2025–2026.Publications are considered relevant when they address AI-supported personalized learning, accessibility, special education, assistive technologies, or educational experiences of students with disabilities.Priority is given to peer-reviewed journal articles and systematic reviews that clearly describe their research aims, methods, and findings. Publications unrelated to educational applications, duplicate records, and sources without sufficient information for meaningful assessment are excluded.Because this is a literature-based study, it does not require collecting personal information from students or conducting direct classroom interventions. Ethical practice requires accurate representation of published research, proper citation, acknowledgment of limitations, and avoidance of unsupported claims

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RESEARCH DESIGN

The study follows a qualitative, descriptive, and interpretive research design. The design examines how recent research describes the contribution of AI to personalized learning in special education classrooms.These dimensions provide a structured framework for comparing findings across the selected literature. The review does not claim to establish causal relationships between AI use and student achievement because no new experimental data are collected.

DATA ANALYSIS

The data analysis for the study titled “Artificial Intelligence for Personalized Learning in Special Education Classrooms” focuses on examining how artificial intelligence (AI) supports individualized instruction, improves student engagement, and enhances learning outcomes among students with special educational needs. This study adopts a qualitative descriptive approach based on the review and analysis of existing research articles, academic journals, and relevant educational literature. The collected information is organized into major themes, including personalized instruction, adaptive learning systems, student engagement, academic achievement, accessibility, teacher support, and the challenges associated with AI implementation in special education classrooms. The analysis explores how AI-powered educational tools can identify students’ learning needs, monitor their progress, and adjust instructional content according to their abilities, preferences, and learning pace. Similarly, speech recognition, text-to-speech applications, intelligent tutoring systems, and AI-supported communication tools may help students with reading, writing, communication, and other learning difficulties participate more effectively in classroom activities.The analysis further examines the potential relationship between AI-based personalized learning and students’ academic performance, including improvements in reading comprehension, mathematical understanding, task completion, problem-solving skills, and independent learning AI systems may also assist teachers by identifying learning gaps, tracking student progress, and generating information that can guide instructional decisionsHowever, the effectiveness of AI-based personalized learning depends on several factors, including the accuracy of the system, the quality of educational content, the suitability of the technology for individual disabilities, teacher training, and the availability of accessible devices and reliable internet connections.

FINDINGS

AI-based learning systems can help adapt educational content, provide additional practice, and recommend activities according to students' demonstrated needs. These capabilities may be particularly useful for students who require different levels of instructional support.Speech recognition, text-to-speech, automated captioning, and simplified explanations may help students access educational material through formats suited to their requirements. However, the usefulness of these tools depends on their accuracy and accessibility.Interactive tutoring, immediate feedback, and adjustable learning activities may encourage participation and independent practice. Nevertheless, engagement should be assessed alongside actual comprehension, skill development, and learning outcomes.AI can support lesson preparation and differentiated instruction, but teachers remain responsible for selecting appropriate materials, monitoring progress, interpreting student needs, and maintaining meaningful

classroom interaction.Privacy risks, algorithmic bias, inaccurate content, limited infrastructure, and insufficient teacher training can restrict the effectiveness of AI-based learning. Recent reviews also highlight the need for stronger empirical evidence, especially concerning the long-term effectiveness of generative AI for neurodivergent students. These findings should be interpreted as a synthesis of existing literature, not as evidence collected from a new classroom experiment.

CONCLUSION

Artificial intelligence offers promising opportunities to support personalized learning in special education classrooms. By adapting instructional materials, providing additional explanations, supporting communication, and offering alternative ways to access information, AI may help address some of the diverse learning requirements of students with disabilities.The literature indicates that AI can contribute to differentiated instruction and educational accessibility. However, its effectiveness depends on appropriate tool selection, reliable content, teacher supervision, accessible design, and equitable access to technology. Privacy, algorithmic bias, and insufficient empirical evidence remain important concerns.The study concludes that AI should be regarded as a supportive educational resource rather than a replacement for teachers, special education professionals, or individualized educational planning. Schools should implement AI tools through clear policies, professional development, student participation, and ongoing evaluation.Future research should investigate the long-term impact of AI-supported instruction on academic achievement, student independence, engagement, and participation. Greater attention should also be given to differences among disability groups, multilingual learners, and schools with limited technological resources.Ultimately, responsible and evidence-based AI implementation may help create more flexible, accessible, and inclusive learning environments for students with special educational needs.

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