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Exploring the Role of Artificial Intelligence in Enhancing Educational Accessibility for Students with Disabilities: A Multidisciplinary Approach

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Abstract

The main theme of the paper is the way Artificial Intelligence (AI) has changed the nature of education among learners with disabilities who must benefit positively by adopting multidisciplinary approach in learning. The article is a cross-sectional review of the recent literature (2020-2025) that deals with the role of AI-based assistive technologies (AT) and personalized learning platforms (PLP) in overcoming different cognitive, sensory and physical limitations. The results prove that AI, via machine learning and Natural Language Processing is a very effective adaptive assistance of real time, and it is a very important cognitive and communication prosthesis. Nevertheless, according to the research, there are other grave multidisciplinary factors, such as the need to establish mass educator AI-literacy, reduce the impact of algorithmic bias, and work on the strong data privacy policies, as well. The paper ends by recommending that computer scientists, special educators and policymakers should work together to address the ethical and structural issues in order to facilitate the attainment of the ethical and sustainable introduction of AI to attain the potential of inclusivity in education.

Keywords: Artificial Intelligence (AI), Educational Accessibility, Students with Disabilities, Personalized Learning, Multidisciplinary Approach

Introduction

The hope of an inclusive and non-discriminatory educational system where all learners have the potential of realizing their potentials is a pillar of the contemporary educational philosophy. But in the case of students with disabilities, the issue of actual educational access has been a longstanding concern that is often undermined by conventional pedagogical restrictions, resource-based factors and inert learning space. The accelerated progress of Artificial Intelligence (AI) is a truly disruptive prospective to break down these barriers and create truly inclusive educational environments (Mitra, 2024; Toyokawa et al., 2023).

The potential of AI in this field is that it is capable of handling an enormous amount of data, identifying intricate trends, and producing adaptive and customized reactions (Ayeni et al., 2024). This ability is ideally compatible with the main principles of Special Education that require extremely personal and adaptable teaching methods. In particular, AI can be used to drive a new generation of assistive technologies (AT) and personalized learning platforms (PLP), which generate adaptable content, speed, and presentation in response to the cognitive, sensory, and physical requirements of a student (Ahmad et al., 2025; Pagliara et al., 2024).

The adoption of AI in this vital industry is not an entirely technological task, this process, in its nature, requires a multidisciplinary strategy. This is only possible through the integration of the knowledge of Computer Science (regarding algorithm development, Natural Language Processing, and Machine Learning), Special Education (regarding pedagogical knowledge and student-centered design), Psychology (regarding cognitive processes, emotional engagement, and learning behaviors), and Ethics/Policy (regarding fairness, privacy, and equity) (Pagliara et al., 2024; Robinson, 2025). This article discusses the multi-faceted nature of AI in improving access to education since the actual change will be possible only within a complex, inter-disciplinary and multi-faceted system. This study aims to present a strong impression of AI in inclusive education in the future, based on the existing applications, opportunities, and the ethical-logistical issues, and references to the current literature published in 2020-2025.

Research Objectives

1. To conduct a systematic investigation and classification of the existing and upcoming applications of Artificial Intelligence (AI) in the formation of assistive technologies and customized learning settings that are specifically made to improve the availability of education to particular students with varied cognitive, sensory, and physical impairments.
2. To investigate how AI-powered solutions can be delivered in mainstream and special education with maximum effectiveness, equity, and sustainability by considering multidisciplinary needs, such as pedagogical, technological, and ethical ones.

Research Questions

1. What are the current applications of AI-driven assistive technologies and customized learning systems using machine learning, natural language processing, and computer vision to effectively eliminate the unique learning and communication obstacles among students with varied types of disabilities?
2. Which pedagogical, technical, and ethical issues are considered to be the most significant when it comes to implementing AI solutions into the inclusive education programs, and what approach to multidisciplinary strategies could be used by educational workers, technological specialists, and policymakers to address those challenges and guarantee equal access to and safety of data?

Literature Review

The last five years (202025) have experienced a glut of studies on AI in education, much of which has been concerned with how AI might be used to transform special education and inclusive education practices. The literature review presents an overview of the important findings in the three principal thematic domains, including AI in Assistive Technology, AI in Personalized Learning, and the Multidisciplinary and Ethical Landscape.

Assistive Technology AI and Communication

The traditional assistive technologies (AT) are usually based on fixed programming. The introduction of AI (and especially machine learning and Natural Language Processing (NLP)) has

made these tools dynamic and adaptive (Ayeni et al., 2024). This is an improvement that is palpable in multiple disability groups:

In the case of speech and language disabilities, AI-powered Augmentative and Alternative Communication (AAC) devices have the capability of identifying non-standard speech, which includes speech involving motor impairments or stuttering, making communication and understanding speech clearer in a learning institution (Venu Govindaraju, 2025). Also, AI applications such as advanced speech-to-text and predictive text software use NLP to significantly decrease the mental and physical effort required to write, making them essential to the learning process of students with a motor disability or learning disability such as dyslexia (Robinson, 2025; VOA Learning English, 2025). A different type of AI is generative AI (GenAI) that is also being investigated as a way of organizing thoughts into outlines and summarizing complex texts and more effectively functioning as a cognitive prosthesis to maximize the cognitive capabilities of learners with disabilities (Herman, 2022; van Boxtel, 2018).

Speechify and NaturalReader, which are text-to-speech applications, are currently being modified to not only read but generate summaries and outlines with the help of AI, thus helping students with focus issues or reading comprehension (Robinson, 2025). The subdivision of AI known as computer vision allows the visually impaired to recognize objects, which would be helpful in navigation and cognition of both the physical and online world (Robinson, 2025).

Mobility is an area where AI-enhanced robotics (including exoskeletons (e.g., Trexo Robotics)) are starting to assist the student with their mobility difficulties, linking the physical world with the educational requirements (Ellen Glover, 2025). Artificial intelligence devices such as voice recognition to write papers and give feedback are also important to teachers and students who have problems with their fingers (Robinson, 2025).

AI in Personalized and Adaptive Learning

Personalization is the fundamental principle of inclusive learning, and AI has the unique capability to provide it on a large scale in Personalized Learning Platforms (PLPs) and Intelligent Tutoring Systems (ITS) (Gibellini et al., 2023; Pagliara et al., 2024).

Adaptive Content Delivery: AI-PPLs (AI-Powered Personalized Learning) apply real-time performance analytics and machine learning to continuously observe student progress and change the difficulty, sequencing, and modality of the content (Gligorea et al., 2023; Hashim et al., 2022). This is an adaptable dynamic that enables disabled students to study at their own rhythm and get specific training on areas of weaknesses in learning (Herman, 2022; Woolf et al., 2013).

Virtual Tutoring and Feedback Virtual instructors and chatbots are the intelligent learning companions that provide diagnostic interventions, micro-lessons, and on-demand clarification (Snyder, 2025). These systems, in turn, offer immediate and tailored feedback, which is especially effective in the case of students who need reinforcements that are regularized and non-judgmental (Robinson, 2025; Zawacki-Richter et al., 2019).

AI is being trained to identify emotions of frustration or lack of attention (affective computing) and react with a sympathetic conversation or propose relaxation, thus creating a motivated and engaged learning experience (Chen et al., 2021). Additionally, AI can assist those students with metacognitive issues by proposing learning tasks (e.g. active recall), as well as reminders on time management (i.e. self-regulation) or time management (i.e. self-organisation) (Zawacki-Richter et al., 2019).

Integration Multidisciplinary and Ethical

The reviewed literature is firmly persuasive that the multidisciplinary approach to AI means covering educators, computer scientists, and policymakers (Ahmad et al., 2025; Choez Calderon and Miranda Bajana, 2024).

Pedagogical and Teacher Role: Although AI has the potential to dramatically decrease the administrative efforts, giving teachers a chance to spend more time on personalized pedagogical guidance (Zahurin et al., 2024; Patino-Toro et al., 2023), the critical issue is teacher training in AI literacy and its integration that is pedagogically informed (Lin and Chang, 2024; Novianti, 2025). AI must not eliminate human-to-human interaction, which is a crucial aspect of emotional and social growth of the students (International Journal of Research and Innovation in Social Science, 2025).

Technical and Infrastructural Barriers: They contain the fair distribution of technological infrastructure, which usually restricts the advantages of AI to learners who are already in a more advantageous position (Holt, 2024; Lin and Chang, 2024). The cost of deploying and sustaining AI systems is quite high and acts as a major barrier especially in low resource environments (Novianti, 2025). Besides, AI models themselves should be trained to recognize various types of speech (e.g., children voice, non-standard speech), handwriting, which currently remains in its dynamic development (Venu Govindaraju, 2025).

Ethical and Policy Challenges: With the advent of AI, there are deeper ethical issues of data privacy and security since educational data is quite sensitive (Klimova et al., 2023; Novianti, 2025). The threat of the concept of algorithmic bias is another significant danger, since improper training data may result in biased evaluation or discriminative treatment of students of marginalized communities (Oluwaseyi Aina Opesemowo, 2025). Also, technological solutionism cautions that we should not see AI as a panacea to stop considering the necessity of more wholesome social and political changes in accessibility (Morozov, 2013; Tucker, 2017). Institutional policies should be clearly defined and well-articulated to make the students not scared to utilize AI tools to access information without any fear of being accused of cheating (Robinson, 2025). According to the existing literature of 2020-2025, AI is obviously a potent, yet a two-sided, means of inclusive education. Its effective implementation requires a fine art of technological innovation and human and ethical application that requires an interdisciplinary effort.

Methodology

The qualitative literature review (meta-synthesis) methodology of this study was based on the interdisciplinary framework. The choice of methodology was made to leverage the results of a wide range of recent academic research (2020-2025) and develop an overall view of the role of AI, opportunities and challenges of accessibility to educational services among students with disabilities. Peer-reviewed journal articles, systematic reviews, conference proceedings, and high-quality organization reports published between January 2020 and December 2025 were used as the

primary sources of data. Systematic search was done in major academic databases, such as Scopus, ERIC, and Taylor and Francis Online.

Multi-block keyword strategy was employed to make sure that the three central topics of the research were highly covered:

AI and Technology: "Artificial Intelligence," "Machine Learning," "Generative AI," "Natural Language Processing," "Computer Vision," "Assistive Technology," "EdTech."

Disability and Accessibility: "Educational Accessibility, Students with disabilities, Special education, Inclusion Education, Cognitive impairments, Sensory impairments, Physical disability.

Approach, Policy: "Multidisciplinary Approach, "Personalized Learning, "Adaptive Learning, "Ethical Challenges, "Data Privacy, Algorithmic Bias.

The Boolean operators (AND/OR) were used to find out the relevant literature: keywords of the three blocks were combined (e.g., ("Artificial Intelligence" AND "Assistive Technology" AND "Students with Disabilities") OR ("AI" AND "Personalized Learning" AND "Special Education" AND 2020-2025).

Inclusion and Exclusion Criteria.

The inclusion criteria were:

Published in the year 2020 or later. Pay attention to the actual use, assessment, or theoretical improvement of AI in the sphere of education with students with disabilities or special needs.

Designated methodological reporting (in the case of empirical research) or solid evidence base (in the case of reviews/reports).

Sources that specifically focus on the pedagogical, ethical, or multidisciplinary side of AI integration.

The exclusion criteria were:

Non-peer-reviewed publications or publications not in academic format (except a high-quality and reputable report).

Research in which AI was something peripheral and non-core to the intervention.

Papers published before the 2020-2025 period.

Data Analysis and Synthesis

The articles that were retrieved were analyzed thematically (Braun and Clarke, 2006). The process involved:

Coding: The first close reading and data coding (with specific attention to AI applications, what disability is being tackled, what the outcomes are (efficacy, usability), and what are some of the challenges (technical, ethical, pedagogical).

Theme Development: Coding all the data into meaningful higher-level themes in accordance with the research objectives and questions with a specific focus on the intersection of technology and pedagogy. The main topics were: AI to create Personalized Content Adaptation, AI to improve Communication, The Need to make Educator AI-Literate, and Ethical Governance.

Meta-Synthesis: A synthesis of the results that creates a shared and evidence-based conception of the role of AI. The focus was on revealing similarities and differences in the literature about the effectiveness of AI and the agreement on the need to implement a multidisciplinary approach to the fair use of AI. The methodology offer a stringent and up-to-date overview of the field and will answer the research questions well by synthesizing the modern scholarly discourse.

Results and Findings

The systematic review produced various significant results that directly respond to the research questions and objectives and can prove the transformative, yet complicated, role of AI in improving the educational access of students with disabilities.

The Adaptive Artificial Intelligence Strength in Overcoming Certain Barriers.

The greatest input of AI is the ability to provide really customized and adaptive assistance, which directly challenges the constraints of universal education.

Cognitive Prostheses and Adaptive Learning Environments

The implementation of AI-PPL (AI-Powered Personalized Learning) has proven to be highly effective in improving the learning performance, due to its ability to adjust to a cognitive profile and pace of a student (Toyokawa et al., 2023).

Difficulty and Pacing Customization: Some of the studies indicated the advantages of intelligent tutoring systems to learners with learning disabilities (e.g., dyslexia, dyscalculia) or with mild cognitive impairments with adaptable grade level and difficulty of content in real-time (Hashim et al., 2022). This personalization assists students to be motivated and learn more quickly, as the instruction is specifically targeted at their gap in skills (Gibellini et al., 2023).

Metacognitive and Executive Functioning Support: AI systems may be used to give a student with ADHD or other executive functioning limitations a timely, personalized reminder on time management, reflection on goals, and strategy suggestions, which is essentially an external, automated scaffolding resource (Zawacki-Richter et al., 2019). The idea of AI as a cognitive prosthesis, which is a device that enhances and supplements cognitive potential of a learner, had been stipulated a lot throughout the literature (van Boxtel, 2018).

Artificial Intelligence Assistive technology (AI-AT)

When applied to AT, the integration of AI turns these tools into dynamic rather than passive and intelligent systems, especially concerning communication and sensory assistance (Ahmad et al., 2025).

Improved Communication: In the case of students with non-standard speech and motor or neurological disorders, AI-based AAC devices apply advanced NLP models trained on a wide

range of voice data to be able to recognise and translate anomalous speech and overcome a significant barrier to classroom learning and social interaction (Venu Govindaraju, 2025). The predictive text systems and GenAI were mentioned as lessening cognitive load on students with writing problems as a system of outlining and summarizing complex texts allowed them to pay attention to what they are saying and how well their ideas are rather than the production process itself (Robinson, 2025).

Sensory and Affective Support: AI-based computer vision (e.g., to recognize objects) and text-to-speech systems creating summaries have enhanced the accessibility of digital content by the visually impaired and those with reading difficulties, as previously inaccessible digital content can now be navigated (Robinson, 2025). The new branch of affective computing, in which AI identifies emotional conditions (e.g., frustration, boredom) to control content delivery, was promising to keep students with autism or attention disorders engaged (Chen et al., 2021).

The Necessary Multidisciplinary Intersection: Problems and Solutions

The process of the successful implementation of the successful AI prototype into the effective, equitable classroom solution is impossible without the profound combination of knowledge in two or more fields. The results indicate that there are three vital problems, which require a multidisciplinary approach.

Gap Pedagogical (Education and Technology)

There is also a consistent theme of the lack of AI-literacy and pedagogical competence among teachers (Lin and Chang, 2024; Novianti, 2025). Educators are not frequently trained to successfully identify, implement, and customize AI-tools into the Individualized Education Program (IEP) model and use them improperly or suboptimally.

Multidisciplinary Strategy: The solution involves involvement of Special Education faculty and Computer Science developers to develop teacher preparation program curriculum (Zawacki-Richter et al., 2019). Such training should go beyond simple operation to encompass the pedagogical effectiveness--what should be done with AI-generated data (analytics) to instrument

a specific human intervention and make AI a complement rather than a replacement to the necessary teacher-student interaction (International Journal of Research and Innovation in Social Science, 2025).

Ethical and Policy Quagmire (Ethics, Policy & Law)

The ethical and policy environment of student data has been determined to be the biggest long-term hindrance (Klimova et al., 2023; Novianti, 2025).

Algorithms bias and privacy: The possibility that the AI algorithms can reproduce or even increase already existing learning disparities (algorithmic bias) is a significant issue, especially when training data is not reflective of diverse student needs (Oluwaseyi Aina Opesemowo, 2025). What makes this even more difficult is that special education data is very sensitive and required to have strong policies of data security, ownership, and transfer (Klimova et al., 2023).

Multidisciplinary Strategy: This would require a collaboration between legal/policy specialists, AI developers and advocacy groups. Institutional-level policies should be introduced that would mandate transparency in AI decision-making (explainable AI) and ensure that the data collection and model testing are inclusive (Lin and Chang, 2024). Moreover, there should be clear and student-focused policies to distinguish between the use of AI in accessibility and academic dishonesty (Robinson, 2025).

Equal Opportunity and Infrastructure (Technology & Socioeconomics)

Cost is one of the economic obstacles that endanger to widen the digital divide because of the infrastructural restrictions (Holt, 2024; Novianti, 2025).

Resource Inequality: The costly, most advanced AI-AT tools have usually been limited to well-funded districts, which develops a two-tier system of educational opportunity.

Multidisciplinary Strategy: The government policy makers have to collaborate with the non-profit organizations, and AI industry developers to develop financially sustainable models. It involves supporting the funding of inclusive infrastructure (e.g., high-speed internet in every school) by the

government and encouraging the creation of open-source or low-cost AI to serve a low-resource setting (Choez Calderon & Miranda Bajana, 2024).

Overall, the findings validate the fact that although AI promises unparalleled opportunities of individualized accessibility, the actual effect of the issue can never be separated of the concerted actions of the multidisciplinary team that would control the pedagogical, ethical, and infrastructural issues.

Conclusion and Future direction.

Conclusion

This study supports the fact that Artificial Intelligence has the potential to transform education accessibility among students with diverse disabilities to a greater extent. The 2020-2025 period has been critical, as it has changed the application theory into the implementation of advanced and adaptive tools. AI-based assistive systems and customized learning platforms, which use machine learning, NLP, and computer vision, are becoming very useful in designing dynamic learning environments capable of personalizing the content, offer feedback in real-time, as cognitive and physical prosthesis (Ahmad et al., 2025; Robinson, 2025; Toyokawa et al., 2023).

Nevertheless, the results also highlight that the complete, fair implementation of this potential, depends on the implementation of a powerful, multidisciplinary approach. Not only technological but more at the borderline of pedagogy, ethics and infrastructure, the greatest challenges are not so much technical but lie in the interface of all three. In particular, narrowing the AI-literacy divide between educators, mitigating the severe risks of algorithmic bias and data privacy, and making the technological benefits equally accessible to all social groups is the work of special educators, computer scientists, psychologists, policymakers, and legal specialists (Klimova et al., 2023; Lin and Chang, 2024). This absence of solving these systemic problems threatens to widen the digital divide and continue to create the very obstacles that AI is supposed to overcome (Holt, 2024).

Future Direction

Inclusive education should look into the following areas which are critical in the future of AI:

1. Education & Psychology Longitudinal Efficacy Studies.
2. Creating Ethical AI Structures (Ethics and Computer Science).
3. Sustainability and Scaling (Policy and Economics)
4. Improvement of Affective Computing.

The bottom line is that AI presents a potent package of tools, yet the human, multidisciplinary dedication to the principles of inclusiveness will make it or break it when it comes to the attainment of educational equity.

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