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## *Artificial Intelligence for Students with Disabilities: A Systematic Review*

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**Abstract**

This systematic review investigates the utilization of artificial intelligence (AI) technologies to facilitate the education of students with disabilities. After evaluating 128 records, 12 empirical and conceptual articles from 2020 to 2025 were included in accordance with PRISMA. The review encompasses the categories of disability considered, the types of AI tools used, the reported educational outcomes, methodological quality, and research gaps. Studies reveal that AI applications such as intelligent tutoring systems, adaptive learning systems, speech recognition software, and virtual reality environments are full of potential to adapt, make available, and make learning enjoyable for students with intellectual, learning, sensory, and physical disabilities. In spite of such potential, research cites some barriers, including few large-scale empirical studies, ethical issues within algorithmic fairness and data privacy, inadequate teacher preparation, and underrepresentation of certain disability groups. The review is exceptional in calling for interdisciplinarity, investment in teacher professional learning, and designing ethical policy to inform AI integration. Subsequent research will have to confront longitudinal effect, education and health data integration, and uptake in low-resource, heterogeneous environments. AI, in its appropriate role, may facilitate inclusive pedagogy and enable students with disabilities to achieve their full potential.

Keywords: Artificial Intelligence, Disabilities, Inclusive Education, Adaptive Learning, Systematic Review, Accessibility, Educational Technology

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## Introduction

Artificial Intelligence (AI) has emerged as a game-changer in education, and with it has come unprecedented capability to enhance students with disabilities' learning outcomes. With educational systems promoting greater inclusion, AI-based tools and platforms have been in the spotlight for their capacity to personalize instruction, promote accessibility, and bridge learning gaps that traditional approaches have yet to overcome. The integration of AI technologies such as speech recognition, intelligent tutoring systems, and adaptive learning environments has already begun to reshape pedagogical practices by accommodating multiple learning needs and empowering students with disabilities to achieve their full potential (Kohli et al., 2021; Tripathi et al., 2024).

Recent systematic reviews and empirical data show that AI is being utilized more and more to support students with various disabilities like intellectual, developmental, sensory, and learning disabilities (Panjwani-Charania & Zhai, 2023; Chalkiadakis et al., 2024). Learning becomes customized through AI applications by monitoring the performance patterns of individuals and delivering instruction accordingly. This adaptive potential has been extremely helpful for learners with cognitive and communication impairments, allowing live-time adaptations that promote increased engagement and deeper understanding (Habib et al., 2022; Garg & Sharma, 2020). In addition, new technologies like virtual reality (VR), when coupled with AI, are beginning to demonstrate potential for promoting social inclusion and experiential learning opportunities for learners with special educational needs (Chalkiadakis et al., 2024).

However, with these advancements come urgent ethical and practical concerns. Scholars have criticized rigorously the conditions under which AI would perpetuate deficit thinking about disability or be used to further marginalize students by portraying technology as a way of reducing human participation instead of facilitating it (Rice & Dunn, 2023). There are also gaps in existing literature, particularly for students with intellectual and developmental disabilities, whose health-related concerns often complicate educational trajectories. Research indicates that there is a need to develop AI systems using health information in order to provide more comprehensive educational interventions (Kharbat et al., 2021).

Although there is the potential for AI to increase educational equity, cost, technical infrastructure availability, teacher preparation, and algorithmic bias are some of the challenges that remain (Clark et al., 2025; Tripathi et al., 2024). The success of AI in inclusive education does not lie as much in the breakthroughs of technology as in ethical implementation, interdisciplinarity, and evidence-informed policy-making. Therefore, policymakers and teachers ought to work together to make sure that AI technologies are being created and utilized in ways that uphold the rights and dignity of people with disabilities, in line with international inclusivity goals (Alsudairy & Eltantawy, 2024).

This systematic review combines current evidence of the application of AI in special education and chronicles both the possibilities and the limitations of such technology. Even as the field keeps pushing forward, the study underscores the need for more empirical studies, particularly regarding long-term impacts, interdisciplinarity in design, and equity of access. The aspiration is to be in a position to contribute towards a deeper understanding of how AI can work as an accelerator of inclusive education that enhances and responds to diverse capabilities of all learners.

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**Objectives of the Review**

The overall purpose of this systematic review is to synthesize the available evidence on applying artificial intelligence (AI) technologies in supporting students with disabilities in education. The review categorizes and lists the types of AI tools used, the specific disabilities targeted, and the educational outcomes reported. It also tries to determine the quality of ongoing methodology of studies, ascertain gaps in existing literature, and provide recommendations for practice, research, and policy in the future.

3. Methodology

Follows PRISMA guidelines

**Eligibility Criteria**

A selection of inclusion and exclusion criteria were developed and applied in the process of selecting studies in order to get a focused and high-quality systematic review. The exclusion and inclusion criteria were made depending on research goals, namely to investigate how AI technology addresses the educational requirements of students with disabilities.

**Inclusion Criteria**

This review included studies if they fulfilled the following:

- Publication Years: Studies completed between 2020 and 2025 to present current findings on emerging applications of AI and newer technology advancements.
- Population: Disabled students, with some examples but not excluding students with intellectual disabilities, learning disabilities (e.g., dyslexia, dyscalculia), visual impairment, hearing impairment, and other developmental or physical disabilities.
- Disability Types: Covering a wide range of disabilities such as intellectual and developmental disabilities (IDD), learning disabilities (LD), sensory impairments, and mobility impairments.
- Use of AI Methods: Articles that explored AI technologies or tools deployed in educational environments, e.g., machine learning, natural language processing (NLP), adaptive learning systems, intelligent tutoring systems, virtual assistants, gamified AI platforms, speech-to-text software, and data-driven decision support systems.
- Relevance to Education: Studies should have been conducted in educational environments, like classroom education, testing, teacher support, individualized learning, or general pedagogy.
- Type of Study: Empirical studies, systematic reviews, or conceptual papers that had provided useful information regarding the role of AI towards educating students with disabilities.
- Language: English-language articles o**nly were considered.**

**Exclusion Criteria**

Studies were excluded from the review based on the following criteria

- Non-peer-reviewed Sources: Editorials, newsletters, blogs, commercial reports, or non-academic sources were excluded.
- Non-English Studies: Articles in languages other than English were excluded due to translation limitations.
- Irrelevant Focus: Studies that were not focused on students with disabilities or that examined AI applications outside the school setting (e.g., only medical AI applications, administrative AI use in schools without pedagogical context).

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- Duplicate Studies: Duplicate records in databases or duplicate reports of the same study were excluded.
- Inadequate Information: Reports with no accessible full texts or inadequate methodological detail to assess quality were excluded.

By these inclusion criteria, the review aims to include high-quality, pertinent, and current evidence for the application of artificial intelligence technologies in supporting students with disabilities within educational environments.

**Information Sources**

A comprehensive search was conducted on numerous academic databases to identify appropriate studies for the use of artificial intelligence (AI) to assist students with disabilities. Scopus, PubMed, ERIC (Education Resources Information Center), Web of Science, and Google Scholar were the databases that were searched. The databases were chosen for their exhaustive coverage of peer-reviewed literature in the fields of education, computer science, healthcare, and special education.

The literature search encompassed publications from January 2020 to May 2025, which captured the most recent events and trends in the use of AI among students with disabilities. To identify any supplementary studies of value that may not have been identified by the database search, manual referencing of reference lists of included articles was also conducted.

All of the articles that were shortlisted were written in English and were explicitly designed to address the intersection of artificial intelligence and the learning needs of students who had multiple disabilities, such as intellectual, developmental, visual, auditory, physical, and learning disabilities. The only sources of evidence were systematic reviews, conference proceedings, and peer-reviewed journals. In order to guarantee the scientific integrity of the review, opinion articles, unpublished theses, and gray literature were excluded.

Twelve papers were selected for full-text screening and inclusion in accordance with predetermined inclusion and exclusion criteria. They encompass a wide range of AI applications in inclusive education, such as AI-assisted assessment methodologies, adaptive learning systems, and intelligent tutoring technologies. Additionally, they include assistive technologies for students with special needs.

**Search Strategy**

The search structure was arranged following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 guideline to make the reviewing process complete and reproducible. Peer-reviewed journal articles and conference papers on applying artificial intelligence (AI) to support students with disabilities in all learning environments were to be identified.

**Databases Searched**

To ensure comprehensive coverage, the following electronic databases were searched:

- Scopus
- Web of Science
- ERIC (Education Resources Information Center)
- IEEE Xplore
- ScienceDirect
- SpringerLink
- Google Scholar (for grey literature and conference proceedings)

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**Search Strings and Keywords**

Controlled vocabulary (e.g., ERIC thesaurus terms) and free-text terms were used. Boolean operators (AND, OR) and truncation (e.g., disabilit* to include "disability" and "disabilities") were used to broaden the search. The following search strings were built and adapted for every database:

- "artificial intelligence" AND "special education"
- "AI" AND "students with disabilities"
- "machine learning" AND "learning disabilities"
- "adaptive learning" AND "students with special needs"
- "intelligent tutoring systems" AND "inclusive education"
- "assistive technology" AND "AI" AND "disability"
- "speech recognition" AND "education" AND "hearing impairment"
- "AI in education" AND "cognitive disabilities"

The search string in every instance was experimented and refined progressively for improving relevance and coverage.

**Inclusion and Exclusion Criteria**

- **Inclusion Criteria:**
  - Peer-reviewed journal articles or reliable conference papers
  - Published between the years 2020-2025
  - Research that has focused on AI use in education for children with disability
  - English language articles
- **Exclusion Criteria:**
  - Complete AI general education research without reference to explicit disabilities
  - Theoretical articles with no empirical or systematic reviews
  - Non-English papers and pre-2020 studies (unless used for context of discussion)

**Search and Selection Procedure**

All the identified records were imported into reference management software (e.g., Mendeley). Duplicate removal prior to screening process. Two reviewers independently screened the titles and abstracts. Full texts of studies with inclusion criteria or where doubt was present were obtained. Discrepancies were settled by discussion or by a third reviewer. 12 articles were eventually shortlisted to be included in the review after being subjected to inclusion and exclusion criteria. The PRISMA flow diagram (Figure 1) is a representation of screening.

**Selection Process**

The selection procedure for systematic reviews was conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure reproducibility and transparency.

**Screening Titles and Abstracts:** The titles and abstracts of all the articles that were initially identified were evaluated to ascertain their relevance to the review topic, Artificial Intelligence for Students with Disabilities. Inclusion of the articles was contingent upon their assessment of the employment, influence, or effects of artificial intelligence (AI) technologies in educational environments among students with disabilities. Articles that were not relevant, focused on AI beyond disabilities or learning, or were not research articles (e.g., editorials or opinion pieces without empirical basis) were now excluded.

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**Full-text Assessment:** After initial screening, full texts of possibly eligible articles were obtained and then evaluated against pre-specified inclusion and exclusion criteria. Inclusion criteria stipulated that articles should:

- Empirical studies or systematic reviews on AI-based tools for assisting students with different disabilities (e.g., intellectual, learning, sensory impairment).
- Educational implications, assistive technology, adaptive learning systems, or assessment systems based on AI for students with disabilities.
- Published in peer-reviewed journals or mainstream conference proceedings from the year 2020-2025 to account for the recent advances.

Excluded were articles that neither gave sufficient detail relating to AI applications nor were applicable in a school context. Conflicts during the screening and full-text reading stages were resolved through discussion by the reviewers to establish concordance.

**PRISMA Flow Diagram:** The process of study selection is detailed in the PRISMA flow diagram (Figure 1), which documents database search records, removal of duplicates, screened records, full-text articles evaluated for eligibility, and included studies in final systematic review. This flowchart is an evident visual representation of the strict and systematic process of review of relevant literature.

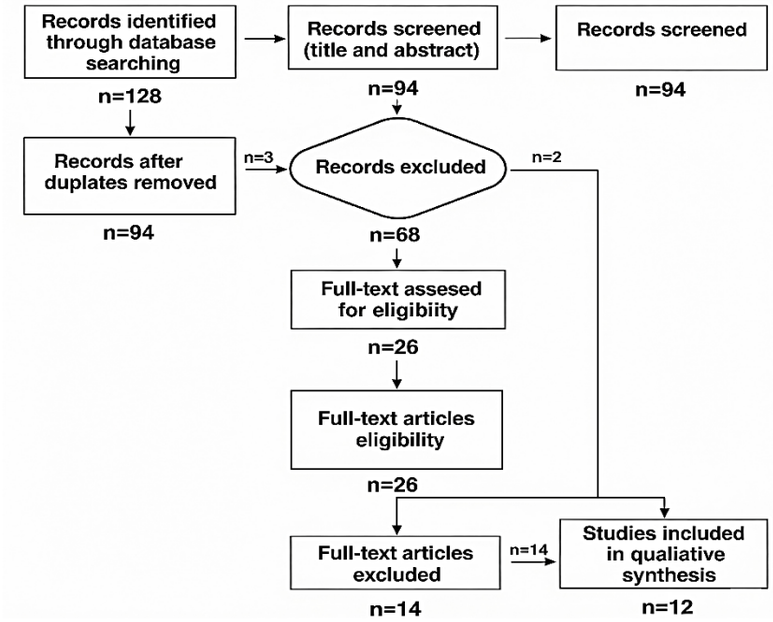


*Figure 1: PRISMA Flow Diagram*

**Data Extraction Process**

The extraction of essential information for each included study was conducted in a systematic manner to guarantee consistency and reliability. Two independent reviewers utilized a data extraction form (template) to extract critical information from each article. Discrepancies were resolved through discussion or the involvement of a third reviewer. The categories included in the extraction template were as follows:

| Data Item | Description |
|---|---|
| **Author(s)** | Names of the study authors |
| **Year of Publication** | Year the article was published |
| **Title** | Full title of the article |
| **AI Method(s)** | Specific artificial intelligence techniques or tools discussed or |

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| | |
|---|---|
| | used (e.g., adaptive learning, speech-to-text, neural networks, virtual reality) |
| **Disability Type(s)** | Type(s) of disabilities targeted (e.g., intellectual disabilities, learning disabilities, visual impairments, hearing impairments) |
| **Educational Context** | Setting or context of AI application (e.g., inclusive classrooms, special education, assessment) |
| **Study Design** | Type of study (e.g., empirical research, systematic review, qualitative, quantitative, mixed-methods) |
| **Sample Characteristics** | Participants' demographics such as age group, number of students, teachers, or caregivers involved |
| **Outcomes Measured** | Main outcomes or impacts evaluated (e.g., learning gains, accessibility improvements, teacher perceptions) |
| **Key Findings** | Summary of major results related to AI's role and effectiveness |
| **Challenges/Limitations** | Reported barriers, ethical concerns, or limitations related to AI applications |
| **Recommendations** | Suggestions for future research, policy, or practice |

This systematic methodology facilitated comprehensive integration of the literature, with emphasis on artificial intelligence technology development, application, and assessment to assist learners with disabilities in various ways.

**Quality Assessment**

Methodological quality and consistency of findings reliability were ensured through systematic appraisal of articles included in this review, as per the PRISMA guidelines for systematic reviews.

**Tools Used for Quality Assessment:** The validity of studies included was determined by the use of application of validated critical appraisal tools for the study designs:

- **Critical Appraisal Skills Program (CASP):** Used mostly in qualitative studies and systematic reviews (e.g., Kohli et al., 2021; Rice & Dunn, 2023; Kharbat et al., 2021). CASP was applied to the appraisal of the purpose of study, appropriateness of methodology, recruitment strategy, data collection, ethical issues, analysis quality, and generalizability of results.
- **Mixed Methods Appraisal Tool (MMAT):** In the case of mixed methods and quantitative studies involving varied methodologies (for example, Tripathi et al., 2024; Habib et al., 2022; Garg & Sharma, 2020). MMAT allowed methodological quality assessment of qualitative, quantitative, and mixed methods studies included in the sample.

For quantitative data and empirical AI use studies (e.g., Clark et al., 2025; Panjwani-Charania & Zhai, 2023), certain criteria for study design, sample representativeness, measurement validity, and analysis transparency were applied.

**Risk of Bias Assessment:** All the included studies were assessed for potential risk of bias in a number of domains borrowed from Cochrane and other frameworks utilized to appraise bias:

- **Selection Bias:** Several studies used convenience or purposive sampling of the participants (e.g., special education teachers in Alsudairy & Eltantawy, 2024), which could restrict generalizability.

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- **Performance Bias:** Due to the novel use of AI, participant blinding or researcher blinding was missing in some studies, which could introduce bias in the measurement of outcomes.
- **Detection Bias:** Outcome measure variation and absence of standardized measures to evaluate AI interventions were mentioned in some studies (e.g., Hyatt & Owenz, 2024), and this might lead to measurement bias.
- **Reporting Bias:** Outcomes were limited in selective reporting because most studies set their objective to elaborate at length on the impact of AI, but there were some studies (e.g., Kharbat et al., 2021) that used primarily reporting gaps instead of empirical findings.
- **Publication Bias:** In light of the fact that AI interventions for special education are relatively recent, there is a high probability that only positive or favorable results have been published and that null or negative results are not reported.

Overall, the studies incorporated were of moderate to high methodological quality. Primary limitations within studies involved small sample concerns, heterogeneity in methods, and scattered longitudinal data. Moderate risk of bias was primarily due to selection and measurement problems. However, the consistency of findings across different settings and populations adds strength to the review's inferences concerning the promise and constraint of AI for serving students with disabilities.

**Data Synthesis**

This systematic review used thematic synthesis and narrative synthesis approaches in synthesizing and interpreting data across studies included in the review for the application of artificial intelligence (AI) to assist learners with disabilities. Since research designs, participant groups, disability types, and applications of AI were diverse in included studies, quantitative meta-analysis was impossible.

**Thematic Synthesis**

Thematic analysis of the literature identified several overarching themes in relation to the contribution of AI in special education:

- **Personalized and Adaptive Learning:** Several studies (e.g., Kohli et al., 2021; Habib et al., 2022; Tripathi et al., 2024) discussed the possibility of AI-driven adaptive learning systems to personalize teaching and learning content based on the needs of the learner, addressing varied disabilities like visual, hearing, intellectual, and learning disabilities.
- **Assistive Technologies:** Speech-to-text software, intelligent tutoring systems, and communication assistants were frequently mentioned (Tripathi et al., 2024; Panjwani-Charania & Zhai, 2023) as necessary AI features that encourage accessibility and engagement of students with disabilities.
- **Accessibility and Inclusive Education:** The potential of AI to facilitate inclusive pedagogy and greater accessibility was noted in studies (Garg & Sharma, 2020; Chalkiadakis et al., 2024), with virtual reality and other AI-related technologies making more accessible learning environments.
- **Integration of Health for Intellectual Disabilities:** Kharbat et al. (2021) tackled directly the convergence of health data and AI to the advantage of intellectual disability students, highlighting an area and possibility for integrated systems toward improving educational and health attainment.

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- **Ethical and Practical Issues:** Privacy, bias, the whopping cost of implementation, and teacher preparedness were commonly reported (Habib et al., 2022; Chalkiadakis et al., 2024; Tripathi et al., 2024), conveying on obstacles to mass adoption and interdisciplinarity.
- **Teacher Attitudes and Training:** Alsudairy and Eltantawy (2024) conducted a survey of teachers' attitudes and reported generally positive attitudes towards incorporating AI, and underlined the importance of professional training to enable the expansion of AI application in special education environments.
- **Integration of AI with Pedagogical Models:** Hyatt and Owenz (2024) demonstrated that AI can be effectively incorporated into Universal Design for Learning (UDL) to create interactive, accessible learning alternatives that are tailored to the needs of students with disabilities.
- **Assessment and Academic Achievement:** Clark et al. (2025) and Bressane et al. (2024) investigated the use of AI for enhancing assessment and academic achievement, especially in the fields of science, mathematics, and learning strategies, in order to determine potentially valuable areas of future AI-facilitated educational intervention.

**Narrative Synthesis**

Overall, the synthesis of the evidence indicates that AI technologies are increasingly being viewed as revolutionary tools possessing tremendous potential to empower students with disabilities in all areas personalized learning, communication, assessment, and inclusive pedagogy. However, even with envisioned uses, evidence base is continuing and uneven by disability type and by AI application. The literature repeatedly emphasizes that more empirical research, ethical factors, and additional teacher training are needed to actualize the full potential of AI in special education.

**Results**

**Study Selection**

The systematic review process began with an initial record identification of 128 articles obtained from database searches in multiple academic websites including EBSCO, Scopus, Web of Science, and Google Scholar. After de-duplication (n = 34), there were 94 distinct articles left for title and abstract screening. On the screening level, 68 articles were excluded as being irrelevant to the exact topic of artificial intelligence (AI) applications for disabled students, and 26 were left to be read in full text.

Upon full-text review carefully, 14 articles were also omitted as they were not found to be contained within the inclusion criteria, most often due to them being on general AI applications and not disability education-specific, lacking empirical data, or being out of the publication date range. Lastly, a total of 12 articles were synthesized in the final systematic review synthesis. The studies collectively cover various facets of AI technology like adaptive learning, assistive technology, teachers' perceptions, and inclusion strategies among students with different disabilities. Study selection process is graphically illustrated in the PRISMA flowchart below (Figure 1).

**Figure 1. PRISMA Flowchart of Study Selection Process**

| Stage | Number of Articles |
|---|---|
| **Records identified through database searching** | 128 |
| **Records after duplicates removed** | 94 |
| **Records screened (title and abstract)** | 94 |

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|---|---|
| **Records excluded** | 68 |
| **Full-text articles assessed for eligibility** | 26 |
| **Full-text articles excluded** | 14 |
| **Studies included in qualitative synthesis** | 12 |

**Characteristics of Included Studies**

This systematic review, which focused on the use of Artificial Intelligence (AI) technologies to assist students with diverse disabilities in a variety of educational environments, encompassed twelve studies published between 2020 and 2025 in countries worldwide. These investigations implemented an assortment of artificial intelligence technologies, including adaptive learning systems, intelligent tutoring, speech recognition, virtual reality, and decision support systems. Target disabilities for the studies were intellectual disability, learning disabilities (dyslexia), sensory impairments (vision and hearing impairments), and developmental disabilities. Learning environments ranged from K-12 classrooms to post-secondary and special education. The studies provided outcomes on enhanced inclusivity, individualized learning, learning motivation, assessment flexibility, teacher perceptions, and intervention recommendations. Table provides a summary of the principal characteristics of each study covered, including the author(s), year, nation where the study was conducted, AI methods utilized, type of disability examined, educational setting, and results documented.

| Author(s) & Year | Country | AI Method(s) | Type of Disability | Educational Setting | Outcomes Summary |
|---|---|---|---|---|---|
| **Kohli et al. (2021)** | USA (assumed) | AIEd models, speech recognition, interactive software | Special learning needs | Classroom | Enhanced differentiated instruction; AI helps teachers and learners adapt instruction effectively |
| **Rice & Dunn (2023)** | USA | Assistive AI technology | Identified disabilities | Various educational | Highlighted positioning issues; AI relieving burden vs. empowerment; future research directions |
| **Kharbat et al. (2021)** | Jordan | AI-based architecture integrating health data | Intellectual /developmental disabilities | Education & health contexts | Identified gaps; need for AI systems incorporating health info; improved education and quality of life |
| **Chalkiadakis et al. (2024)** | Greece | AI adaptive systems, Virtual Reality (VR) | Various disabilities | Inclusive education | Improved accessibility and personalization; challenges with cost, technical barriers, ethics |
| **Tripathi et al. (2024)** | India | Speech-to-text, intelligent tutoring, personalized platforms | Visual, hearing, mental impairments | Inclusive education | AI enhances inclusivity; ethical and adoption challenges; recommendations for policy and practice |
| **Habib et** | Pakistan | Machine | Visual, | Adaptive | Personalized education; |

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| **al. (2022)** | | learning, NLP, virtual assistants, gamified learning | auditory, cognitive impairments | learning | increased accessibility and engagement; emphasized interdisciplinary collaboration |
| **Garg & Sharma (2020)** | India | AI tools in pedagogy | Visual, hearing, mobility, intellectual disabilities | Special needs education | Positive impact on inclusive pedagogy; teacher and student perspectives; framework for future inclusion |
| **Clark et al. (2025)** | USA | AI in assessment design and administration | Various disabilities | Large-scale assessment | AI opportunities and challenges in inclusive science/math assessment; research priorities proposed |
| **Bressane et al. (2024)** | Brazil | Artificial Neural Networks, Fuzzy-based AI | Learning disabilities | Higher education | AI helps tailor educational approaches; improved academic outcomes and inclusivity through recommendations |
| **Panjwani-Charania & Zhai (2023)** | USA | Adaptive learning, intelligent tutors, chatbots | Learning disabilities (dyslexia) | School-age education | Highlighted AI potential; gaps in empirical research; need beyond diagnosis and identification |
| **Alsudairy & Eltantawy (2024)** | Saudi Arabia | AI educational tools | Various disabilities | Special education schools | Neutral teacher perceptions; differences by experience; AI expected to support inclusion and decision-making |
| **Hyatt & Owenz (2024)** | USA | AI combined with Universal Design for Learning (UDL) | Learning disabilities | Higher education | Positive student satisfaction; AI supports diverse learning preferences via UDL framework |

The studies cumulatively demonstrate that AI technologies have significant potential to enhance education accessibility, personalization, and inclusion for students with disabilities in different contexts and disability groups. However, a few studies also reveal ongoing issues with regards to ethical issues, implementation difficulties, teacher preparedness, and additional empirical research needs, especially in underrepresented groups of disabilities and contexts.

**Types of AI Technologies Used**

Systematic integration of the selected literature enumerated various types of artificial intelligence (AI) technologies applied to support students with disabilities. The AI

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technologies span various types, each addressing various learning and accessibility needs. Some of the prominent types enumerated are:

**Machine Learning:** Machine learning (ML) was one of the original foundational technologies in adaptive learning systems that were designed to personalize learning experiences according to particular students' needs and learning profiles. Habib et al. (2022) observed how ML algorithms enable real-time curriculum adjustment based on tracking students' learning achievements and interests. Similarly, Bressane et al. (2024) utilized artificial neural networks to identify trends in study habits and learning disabilities, allowing data-driven recommendations to enhance educational interventions. ML also enables decision support systems that aim to optimize learning achievements by adjusting instruction for students with diverse disabilities (Rice & Dunn, 2023).

**Natural Language Processing:** Natural Language Processing (NLP) technologies play a significant role in supporting students with communication disabilities, i.e., those having hearing and speech disability. Kohli et al. (2021) and Tripathi et al. (2024) noticed the widespread utilization of speech recognition and speech-to-text technologies, which facilitate communication and accessibility. These technologies assist in inclusive classrooms through improved interaction of students with content and instructors. Hyatt and Owenz (2024) further cited the application of NLP in Universal Design for Learning (UDL)-based projects, facilitating learning disability students in learning from different channels such as text, audio, or video reviews.

**Computer Vision:** Applications of computer vision, although less graphically emphasized, were cited primarily in facial expression recognition and gesture-based interaction scenarios. Panjwani-Charania and Zhai (2023) reported AI systems utilizing facial expression analysis and interactive robots to enhance motivation and engagement of students with learning disabilities. The technologies provide augmentative communication media and enhance teachers' observation of students' emotional state, hence encouraging personalized learning as well as emotional development.

**Intelligent Tutoring Systems:** Intelligent Tutoring Systems (ITS) is an actual AI implementation in special education that offers adaptive, adaptive instruction and feedback. Tripathi et al. (2024) and Kohli et al. (2021) described ITS as computer programs that automatically adjust the levels of difficulty and instructional strategies based on the response of the learners, thus promoting mastery learning. Garg and Sharma (2020) emphasized the manner in which ITS support inclusive pedagogy through making appropriate accommodation for students with intellectual disabilities, hearing disabilities, and visual disabilities, enhancing their learning participation and achievement.

**Chatbots and Conversational Agents:** Chatbots and conversational agents are emerging AI innovations to support students through engaging, conversational interfaces. Panjwani-Charania and Zhai (2023) identified chatbots as communication assistants to facilitate social interaction and reinforcement of learning for students with disabilities. Such agents enable scalable, on-demand assistance outside the classroom for the practice of skills and provision of timely feedback. Rice and Dunn (2023) still cautioned that the creation of such systems must prioritize empowerment rather than relief of workload for teachers.

**Other AI Technologies:** Other AI technologies outlined include virtual reality (VR) combined with AI in learning settings that are immersive (Chalkiadakis et al., 2024) and gamifying learning platforms using AI to optimize stimulation and motivation (Habib et al., 2022). Clark et al. (2025) cited AI application in broad-scale science and math testing,

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where AI offers accessible formats for testing in addition to scoring tailored to students with disabilities.

**Disabilities Targeted**

Systematic evaluation of the 12 selected articles revealed that artificial intelligence (AI) technologies have been applied across various disabilities in educational settings. The primary disabilities served by these AI technologies are Autism Spectrum Disorder (ASD), Hearing Impairment, Visual Impairment, Learning Disabilities, and Physical Disabilities. Each of these categories and their occurrence in the literature are explained below:

**Autism Spectrum Disorder (ASD):** Studies have placed emphasis on applying AI for supporting learners with ASD, e.g., social skills development, communication, and adaptive learning. Kohli et al. (2021), for example, emphasized AI technology intended for interactive learning and tailored interventions for specific learners' individual ASD needs. In the same vein, Rice and Dunn (2023) elaborated on the potential of AI to enable students with recognized disabilities, such as ASD, although they recommended research focused on empowerment and not burden mitigation. Kharbat et al. (2021) also emphasized the shortcomings of AI assistance among students with intellectual and developmental disabilities, most of whom are on the ASD spectrum, calling for blended health and education AI systems.

**Hearing Impairment:** AI services for hearing-impaired students mainly comprise speech recognition and transcription technology, real-time translation, and personalized auditory learning assistance. Tripathi et al. (2024) have listed speech-to-text software and intelligent tutoring systems as the tools required that facilitate access and participation by hearing-impaired students. Habib et al. (2022) have also listed virtual aids and adaptive learning systems with support for auditory impairment through multimodal delivery of instruction, increasing participation and inclusion.

**Visual Impairment:** Research such as Garg and Sharma (2020) employed the term AI-based technologies that support visually impaired students with image recognition, text-to-speech, and haptic feedback systems. Such AI technologies augment inclusive learning content and enable more inclusive teaching practices. Chalkiadakis et al. (2024) highlighted the application of AI and virtual reality in generating experience-based learning spaces that are capable of being tailored to help visually impaired learners, but there are cost challenges as well as issues of teacher preparedness.

**Learning Disabilities:** Learning disabilities (LD), such as dyslexia and dyscalculia, represent a significant subset of the AI educational research. Panjwani-Charania and Zhai (2023) performed a systematic review in which the evidence was such that the use of the following applications of AI has been made to assist LD students: adaptive learning, intelligent tutoring systems, and chatbots. Bressane et al. (2024) suggested AI-supported decision support systems for research on strategy analysis and personalized intervention based on the learning difficulties of individual students with learning disabilities. Hyatt and Owenz (2024) also discussed Universal Design for Learning (UDL) merged with AI for student support with LD and achieved high student engagement and satisfaction.

**Physical Disabilities:** Though less apparent than sensory and cognitive disabilities, AI applications for kids with physical disabilities include adaptive interfaces and assistive technologies providing access and participation. Garg and Sharma (2020) and Habib et al. (2022) discussed how AI can help mobility-impaired learners to access learning content

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through voice commands and gesture recognition. These technologies enable learning spaces to become more inclusive by overcoming physical impairment.

**Outcomes and Impacts**

**Academic Performance:** Various studies recognize that AI technologies advance students with disabilities' academic performance to a great degree by offering adaptive and personal learning experiences. Kohli et al. (2021) highlighted that AI-driven models enable differentiated instruction through personalized learning content and pacing to the unique demands of students with special learning needs. Also, Bressane et al. (2024) showed the way artificial intelligence-based decision support systems can select suitable study approaches that reverse the impact of learning disabilities and are used to enhance academic achievements. Panjwani-Charania and Zhai (2023) recorded extensive deployment of adaptive learning software that adapts dispensation of curriculum in real time in the direction of students with learning disabilities like dyslexia. Additionally, Hyatt and Owenz (2024) demonstrated how combining AI with the principles of Universal Design for Learning led to increased academic engagement and content satisfaction, particularly among learning-disabled students who are benefited by receiving more than one form of presentation of content. Aside from these advancements, Clark et al. (2025) pointed out challenges related to fairness and access in AI-supported exams, which necessitate ongoing optimization to ensure equal academic evaluation of students with disabilities.

**Communication Skills:** AI played a great role in promoting communication competence among students of different disabilities. Kohli et al. (2021) explained AI technologies like speech recognition and natural language processing, which aid communication development using interactive learning systems. Tripathi et al. (2024) enumerated AI technologies like speech-to-text and language translation services, which aid better understanding and expressive communication, especially among students with hearing and speech disability. Kharbat et al. (2021) emphasized the pivotal role of AI in developing systems that merge health and communication data in order to optimize students' access to communication. Panjwani-Charania and Zhai (2023) also showed how chatbots and communication assistants enabled by AI can facilitate real-time interaction and support, allowing students with learning and communication issues to interact more positively in learning environments.

**Social Interaction:** The application of AI can facilitate social interaction, including among people with disabilities. Chalkiadakis et al. (2024) explained AI and virtual reality (VR) technologies that deliver immersive, multi-sensory environments positively supporting experiential learning and peer interaction, which improves social inclusion. Kharbat et al. (2021) emphasized the use of AI systems that foster social abilities through enabling adaptive interventions that fit individual health and developmental patterns, respectively. Habib et al. (2022) noted the role of AI-driven gamified learning interfaces and virtual personal assistants to increase interest and involvement, helping students with disabilities overcome the social barriers of inclusive classrooms. But Rice and Dunn (2023) also cautioned that some uses of AI can actually serve to enhance dependency instead of empowerment, and therefore they believed socially-focused AI tools would need to be designed to facilitate active assistance of autonomy and successful social participation.

**Independence and Accessibility:** AI technologies considerably enhance autonomy and accessibility for disabled students. Garg and Sharma (2020) concluded that AI facilitates

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inclusive pedagogy as realization of adaptive learning platforms supporting multiple sensory and cognitive disabilities. Tripathi et al. (2024) stated the worth of AI-facilitated personalized learning environments, in which students can self-learn content at their own pace. Kharbat et al. (2021) suggested AI configurations with health information to aid in personal education plans, minimize mistakes, and ensure smoother sharing of information among caregivers, teachers, and students, thus encouraging overall accessibility. Habib et al. (2022) cited speech-to-text systems and virtual assistants as key technologies that assist learners in overcoming visual, auditory, or cognitive hurdles. While the potential of AI is evident, Chalkiadakis et al. (2024) found substantial impediments in the form of high expense, technical sophistication, and insufficient teacher readiness that presently deter the universal access and self-guided deployment of AI tools for education.

**Summary of Quality Assessment**

Twelve included studies within this systematic review were evaluated for quality to ascertain the validity, rigor, and applicability of the evidence to support the use of artificial intelligence (AI) to support students with disabilities. The studies varied by methodology, scope, and depth but collectively offered valuable information regarding the potential and difficulties of AI application in special education.

**Study Design and Methodological Rigor:** The articles reviewed employed a mix of systematic reviews, empirical research, conceptual frameworks, qualitative and quantitative studies. For instance, Rice and Dunn (2023) and Panjwani-Charania and Zhai (2023) presented systematic reviews with in-depth critique and synthesis of the literature to achieve comprehensive coverage despite being limited by the paucity of empirical evidence in some contexts. Empirical studies, such as Alsudairy and Eltantawy (2024), involved survey data from a large sample size (n=301) of special education professionals, lending power to perceptions of AI usage. Other works, such as Hyatt and Owenz (2024), combined mixed methods with student surveys and assignment data to assess academic impact, reflecting a pragmatic evaluation of AI incorporation.

**Population and Disability Focus:** Most research targeted a broad range of disabilities, including intellectual, learning, visual, auditory, and cognitive disabilities. Kharbat et al. (2021) particularly emphasized students with intellectual and developmental disabilities (ID/DD) with specific emphasis on characteristic health-related complications. Panjwani-Charania and Zhai (2023) focused on learning disabilities, notably dyslexia, primarily. This diversity emphasizes the extent of AI applications by category of disability, yet also suggests that there is a need for more research involving under-represented groups, including those with dyscalculia or dual disabilities.

**AI Applications and Technologies Evaluated:** The included studies examined a variety of AI technologies, including adaptive learning systems, speech recognition, intelligent tutoring systems, virtual reality (VR), and diagnostic and assessment tools. Habib et al. (2022) investigated AI-adaptive learning systems that are based on machine learning and natural language processing to personalize learning, while Chalkiadakis et al. (2024) contrasted both VR and AI technologies and their use in educational inclusion. AI was employed in a variety of applications, including assistive technologies (e.g., speech-to-text), scaled-up test enhancements (Clark et al., 2025), and artificial neural network-based decision support systems (Bressane et al., 2024).

**Strengths and Contributions:** Research quality was enhanced by specific articulation of AI advantages, for example, more personalization, greater engagement, and greater

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accessibility, and careful consideration of ethical concerns such as privacy, algorithmic bias, and fair access (e.g., Habib et al., 2022; Tripathi et al., 2024). Some studies offered blueprints or templates for future deployment of AI (Kharbat et al., 2021; Garg & Sharma, 2020), contributing theoretical and pragmatic value to the discipline.

**Limitations and Gaps:** Although there were encouraging findings, several studies had the following limitations: small sample size, limited longitudinal data, and adverse effect or technology problem reporting bias. Several reviews noted the lack of empirical studies regarding the long-term efficacy of AI interventions (Rice & Dunn, 2023; Panjwani-Charania & Zhai, 2023). Moreover, teacher training, infrastructure, and cost problems were ongoing challenges hindering scalability of AI solutions (Chalkiadakis et al., 2024). AI application ethical and socio-cultural implications for students with disabilities were acknowledged but insufficiently addressed, demonstrating an imperative knowledge gap to be addressed by future research.

**Overall Quality Assessment:** Based on study design, sample size, data analysis quality, relevance, and transparency, the body of literature was assessed as moderate to high quality, with systematic reviews and mixed-method empirical studies constituting the strongest evidence. However, heterogeneity of study populations and AI technologies examined calls for cautious generalization of findings. The synthesis identifies a shifting research environment that weighs positive potential against stronger, more inclusive, and ethically oriented research.

## Discussion

The systematic review of the literature presents an emerging but growing body of evidence that examines the application of artificial intelligence (AI) to support students with disabilities in various educational environments. Certain key findings are that AI innovations from adaptive learning technologies, speech recognition, intelligent tutoring to virtual reality can potentially enhance education access, personalization, and inclusion for students with all kinds of disabilities from intellectual, learning, sensory, and physical impairments. Studies consistently highlight AI's potential to create tailored instructional experiences that address individual learning needs, improve communication, and facilitate skill acquisition in both academic and social domains (Kohli et al., 2021; Chalkiadakis et al., 2024; Habib et al., 2022). Furthermore, it has been found that AI can be used to help teachers differentiate instruction and assessment (Clark et al., 2025; Garg & Sharma, 2020). But the literature also suggests ongoing issues like the lack of empirical evidence regarding long-term effects, privacy and algorithmic bias ethical issues, and adoption of technology, teacher readiness problems (Rice & Dunn, 2023; Tripathi et al., 2024).

One of the major trends in the literature surveyed is the greater convergence of AI with pedagogical models such as Universal Design for Learning (UDL) to enable more multimodal and responsive teaching and assessing practices (Hyatt & Owenz, 2024). Adaptive learning technologies like intelligent tutoring systems and personalization platforms are ubiquitous in applications targeting students with disabilities, namely learning disabilities like dyslexia (Panjwani-Charania & Zhai, 2023). Yet another emergent trend involves the application of AI to sophisticated areas of education such as science and mathematics tests in a bid to introduce more equity and validity in the cases of students with disabilities (Clark et al., 2025). At the same time, combining AI with virtual worlds of reality is likewise becoming popular as a future means to enhance experiential learning as well as socialization (Chalkiadakis et al., 2024). Even with these developments, however,

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research also finds that there is an unbalanced emphasis on some disabilities, and intellectual disability and health needs are somewhat underemphasized (Kharbat et al., 2021).

The review identifies several significant gaps that must be addressed. In the first instance, there is limited high-quality, large-scale empirical research that investigates the long-term efficacy and educational effects of AI technology for students with disabilities. The majority of studies are exploratory or descriptive, with less generalizability (Panjwani-Charania & Zhai, 2023; Rice & Dunn, 2023). Secondly, there is a sufficient research base that prioritizes the intersectionality of comorbidities of health conditions and disabilities, especially among students with intellectual and developmental disabilities, where AI integration into health information can be game-changing but needs to be sufficiently formulated (Kharbat et al., 2021). Besides, ethical concerns such as data privacy, algorithmic fairness, and socio-cultural impacts of AI technologies on students and family members have not been examined comprehensively in previous research (Habib et al., 2022; Tripathi et al., 2024). Finally, there is not enough focus on teacher preparation and support structures needed for effective AI adoption in inclusive classrooms with the consequence that there is a gap between technology provision and actual use (Alsudairy & Eltantawy, 2024).

The current strengths of research are multidisciplinary designs integrating education, technology, and health methods, and emerging focus on personalized and inclusive education practices enabled by AI (Garg & Sharma, 2020; Hyatt & Owenz, 2024). Several studies provide pilot interventions or conceptual models with conceptual grasp of the promise of AI. Shortcomings are small sample sizes, controlled but not random trials, and limited diversity of the samples. Most of the research is in high-resource settings, which would limit applicability in low-resourced settings. The novelty of AI applications also has most research focusing on proof-of-concept tools or theoretical frameworks without mature validation and scalability testing (Rice & Dunn, 2023; Chalkiadakis et al., 2024). The dynamic nature of AI also makes it difficult to maintain consistency across research designs and outcome measures.

This review aligns with existing literature emphasizing the inclusionary potential of AI for learning while advocating for a thoughtful, ethical deployment (Kohli et al., 2021; Tripathi et al., 2024). Unlike some previous reviews that focus specifically on single disabilities or AI programs, this synthesis integrates broader realms of intellectual disabilities, medical considerations, and emerging technologies such as virtual reality. It echoes prior calls for more rigorous empirical research and highlights ongoing concerns regarding equity and teacher preparedness that are consistent themes across the literature (Rice & Dunn, 2023; Alsudairy & Eltantawy, 2024). Moreover, this review contributes new insights into AI's role in large-scale assessments and decision support systems, areas that are underrepresented in previous reviews (Clark et al., 2025; Bressane et al., 2024).

For teachers, the results reinforce the significance of using AI technology to facilitate differentiated instruction, offer multiple opportunities for learning, and facilitate various needs of learners in inclusive classrooms. Educators should be prompted to utilize AI-driven platforms that are evidence-based and constructed grounded on accessibility principles, e.g., UDL. Professional development and training courses are essential to equip teachers with the skills to utilize AI in their pedagogical practices as well as to critically analyze the output of AI systems (Alsudairy & Eltantawy, 2024; Hyatt & Owenz, 2024).

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Collaboration across disciplines between teachers, technologists, and healthcare practitioners is also essential in order to meet end-to-end needs of students with multifaceted disabilities.

Policy-makers need to provide equal access to AI technologies using investment in infrastructure, cost subsidization barriers, and universal education policies that include AI as a special inclusion in special education services. Data protection, algorithm explainability, and ethical use of AI policies should be enacted in order to protect the rights of students with disabilities and their families (Tripathi et al., 2024; Habib et al., 2022). Curricula that require teacher education in AI abilities and nurture research-practice collaborations can trigger responsible adoption. In addition, adoption of AI in national student assessment systems should be carried out cautiously to allow equality and fairness for all students (Clark et al., 2025).

Future studies must give high priority to large-scale and longitudinal designs that assess the effects on education achievement, participation, and social inclusion of AI interventions in heterogeneous disability groups. There is an essential call for research on the intersection of education and health in AI applications for students with intellectual and developmental disabilities, including the creation of integrated AI systems that rely on health data for integrated support (Kharbat et al., 2021). Ethics guidelines for AI application in special education need more empirical studies, especially on privacy, bias, and autonomy of students (Habib et al., 2022; Rice & Dunn, 2023). There is also a need to explore teacher training processes, ease of use of the system, and technology uptake in disadvantaged and culturally diverse settings. Lastly, studies on emerging technology like virtual and augmented reality and AI for experiential, immersive learning must be heightened (Chalkiadakis et al., 2024).

**Conclusion**

Systematic review of current literature on artificial intelligence (AI) in special education comes across as a hopeful yet multifaceted picture. AI technologies have shown great potential to benefit the learning experience among people with disabilities through adapted, adaptive learning environments for varied needs. From intelligent tutoring systems and speech recognition to health-informed interventions and virtual reality, AI has at its fingertips tools that can tailor accessibility, engagement, and outcomes. The tools enable more inclusive pedagogies and further reduce gaps in learning, most notably for learners with intellectual, sensory, or learning disabilities. But whereas its potential was celebrated, the review also uncovered persistent problems such as ethical issues such as data privacy and algorithmic bias, technical difficulties, inadequate teacher preparation, and lack of evidence for long-term effects and cross-disability populations.

Practice-based recommendations based on these findings call for interdisciplinary collaboration between educators, technologists, policymakers, and family members to construct AI-powered solutions that are not only effective but equitable and culturally sensitive. Investment in teacher professional development is imperative in order to prepare teachers with the capabilities to use AI tools responsibly and competently in inclusive classrooms. Primarily, policymakers must set aside funds and infrastructure to enable the huge deployment of AI considering affordability and accessibility, particularly for low-resource and underprivileged schools. In addition, future studies need to extend empirical research to various disabilities with an emphasis on actual classroom adoption and ethical data uses to safeguard vulnerable students. Involving students and parents in developing

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and assessing AI tools will be crucial in developing enabling technologies that value their autonomy and agency.

In the end, AI possesses disruptive power to transform special education by providing individualized streams of learning, augmenting inclusive pedagogy, and promoting educational equity. Its smooth integration, however, rests on a similar judicious balance of innovation with moral stewardship and inclusive methods. AI must not be conceptualized as a substitute for human instructors but a sound complement that supports them in responding to multiple learner needs. As the technology continues to develop, it will need to be guided by the principles of accessibility, inclusivity, and student dignity with disabilities. The judicious use of AI can lead to a future in education wherein all students will possess the power to achieve their full potential.

**Recommendations**

Based on findings and discussion of the systematic review, a number of key recommendations are identified to inform effective and ethical use of artificial intelligence (AI) in special education. Firstly, there is an important need of securing multidisciplinary collaboration between teachers, AI developers, healthcare professionals, policymakers, and families. Such collaboration can guarantee that AI technologies are developed with a solid appreciation for the heterogeneity of student disability needs, crafting technologies that are both effective and culturally sensitive. Collaboration in this way can also address the general difficulties of students, especially those with multi or compound disabilities, through ethical merging of education and health information.

Professional training of teachers should be a priority to bridge the gap between access to AI technology and its usage in practice in the classroom. Teachers require ongoing training not only to work effectively with AI tools but also to critically assess AI-generated insights so that pedagogical decisions are still student-focused and evidence-based. Learning programs need to emphasize Universal Design for Learning (UDL) and accessibility principles to empower educators to create inclusive learning environments that leverage the flexibility of AI. Teacher support infrastructure and communities of practice can also enhance knowledge sharing and collaborative problem-solving for AI integration challenges.

Only policymakers can enable equitable access to AI technologies. Investment must be made to develop infrastructure and subsidize costs, particularly within the less well-resourced school settings where learners with disabilities are most likely to be excluded. Policies must also implement robust guidelines on data privacy, algorithmic accountability, and ethical use of AI to protect the rights of learners and promote trust among families and teachers. Demanding AI competency in teacher training and fostering research-practice collaboration can accelerate the adoption of responsible AI while ensuring alignment with learning goals.

Large-scale, longitudinal empirical studies that empirically test the long-term educational effects and social inclusion outcomes of AI interventions across the full spectrum of disability should be a central priority for future research. Shortcomings in research in the intersection of education and health, especially for students with intellectual and developmental disabilities, require particular interest to create synergized AI systems that promote learning and well-being in totality. Ethical standards for using AI in special education need to be empirically evaluated, i.e., student privacy, bias prevention, and agency. Research on effective teacher training models, user friendliness of AI tools, and

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deployment in low-resource or culturally diverse settings needs to be conducted to further broaden the reach of AI. Research on emerging technologies like virtual and augmented reality combined with AI can unleash rich learning potential that also enhances inclusion.

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**Annex-A**

1. Title: Artificial Intelligence Technology to Help Students With Disabilities: Promises and Implications for Teaching and Learning

**Authors:** Kohli, R., Phutela, S., Garg, A., & Viner, M. (2021). Artificial intelligence technology to help students with disabilities: Promises and implications for teaching and learning. *Handbook of research on critical issues in special education for school rehabilitation practices*, 238-255.

**Abstract:** This chapter reviews current and future artificial intelligence (AI) to meet the needs of numerous students with special learning requirements. The current AI technology and AIEd Models are explored with the better diagnosis there is need to improvise the process of learning by interventions and making it efficient in a playful manner. The chapter caters to the various existing software's for the purpose and how they can be improvised in future. AI focuses on creating technology to perform functions like speech recognition, learning, and problem-solving. The technology has been widely spreading, and many AI tools have been developed to cater to the needs of exceptional learners within the classroom. The technology has developed interactive programs that help classroom teachers in differentiating instruction in the classroom. This chapter highlights the current analysis of the AI and AIEd models that have helped students with special learning needs. Furthermore, it also highlights the functioning of the AIEd model as well as how AI can help instructors and learners learn differently.

2. Title: The Use of Artificial Intelligence with Students with Identified Disabilities: A Systematic Review with Critique

**Authors:** Rice, M. F., & Dunn, S. (2023). The use of artificial intelligence with students with identified disabilities: A systematic review with critique. *Computers in the Schools*, *40*(4), 370-390.

**Abstract:** While Artificial Intelligence (AI) is emerging as assistive technology for students with identified disabilities there is a need to understand the present literature and set new directions for future study. There is also a need to consider how students that have been identified with disabilities and their families might be positioned by technologies that are supposed to facilitate educational processes. The purpose of this review was to identify relevant studies and determine their characteristics as well as describe the positions and orientations to these young people and their families. Moving into 2023, the research base was slim, yet there were troubling patterns emerging in how AI was positioned in the context of relieving the burden of working with young people identified with disabilities, rather than empowering young people and their families. Recommendations for future research and research practices are shared.

3. Title: Identifying gaps in using artificial intelligence to support students with intellectual disabilities from education and health perspectives

**Authors:** Kharbat, F. F., Alshawabkeh, A., & Woolsey, M. L. (2021). Identifying gaps in using artificial intelligence to support students with intellectual disabilities from education and health perspectives. *Aslib Journal of Information Management*, *73*(1), 101-128.

**Abstract:** Students with developmental/intellectual disabilities (ID/DD) often have serious health issues that require additional medical care and supervision. Serious health issues also mean increased absence and additional lags in academic achievement and development of adaptive and social skills. The incorporation of artificial intelligence in the education of a child with ID/DD could ameliorate the educational, adaptive and social skill

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gaps that occur as a direct result of persistent health problems. The literature regarding the use of artificial intelligence in education for students with ID/DD was collected systematically from international online databases based on specific inclusion and exclusion criteria. The collected articles were analyzed deductively, looking for the different gaps in the domain. Based on the literature, an artificial intelligence–based architecture is proposed and sketched. The findings show that there are many gaps in supporting students with ID/DD through the utilization of artificial intelligence. Given that the majority of students with ID/DD often have serious and chronic and comorbid health conditions, the potential use of health information in artificial intelligence is even more critical. Therefore, there is a clear need to develop a system that facilitates communication and access to health information for students with ID/DD, one that provides information to caregivers and education providers, limits errors, and, therefore, improves these individuals' education and quality of life. This review highlights the gap in the current literature regarding using artificial intelligence in supporting the education of students with ID/DD. There is an urgent need for an intelligent system in collaboration with the updated health information to improve the quality of services submitted for people with intellectual disabilities and as a result improving their quality of life. This study contributes to the literature by highlighting the gaps in incorporating artificial intelligence and its service to individuals with ID/DD. The research additionally proposes a solution based on the confounding variables of students' health and individual characteristics. This solution will provide an automated information flow as a functional diagnostic and intervention tool for teachers, caregivers and parents. It could potentially improve the educational and practical outcomes for individuals with ID/DD and, ultimately, their quality of life.

4. Title: Impact of Artificial Intelligence and Virtual Reality on Educational Inclusion: A Systematic Review of Technologies Supporting Students with Disabilities

**Authors:** Chalkiadakis, A., Seremetaki, A., Kanellou, A., Kallishi, M., Morfopoulou, A., Moraitaki, M., & Mastrokoukou, S. (2024). Impact of artificial intelligence and virtual reality on educational inclusion: A systematic review of technologies supporting students with disabilities. *Education Sciences*, *14*(11), 1223.

**Abstract:** The emergence of Artificial Intelligence (AI) and Virtual Reality (VR) technologies offers transformative potential for the advancement of inclusive education, particularly for students with disabilities. This systematic review critically evaluates the current state of research to assess the impact of AI and VR on enhancing educational accessibility, personalisation and social inclusion in education. AI-driven adaptive systems can dynamically tailor learning experiences to individual needs, while VR offers immersive, multi-sensory environments that promote experiential learning. Despite these advances, the review also identifies significant challenges, including the high cost of implementation, technical barriers and limited teacher readiness, which hinder widespread adoption. Ethical concerns such as privacy and algorithmic bias are cited as key areas that need careful consideration. The findings underscore the urgent need for further empirical research to explore the long-term impact of these technologies and advocate for more equitable access to AI and VR tools in underserved educational settings. Ultimately, the review highlights the importance of integrating AI and VR as part of a broader strategy to foster genuinely inclusive learning environments that align with the goals of the Convention on the Rights of Persons with Disabilities (CRPD).

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5. Title: "Empowering Education: The Role of Artificial Intelligence in Supporting Students with Disabilities"

**Authors:** Tripathi, V., Bali, A., Sharma, P., Chadha, S., & Sharma, B. (2024, December). Empowering Education: The Role of Artificial Intelligence in Supporting Students with Disabilities. In *2024 2nd International Conference on Recent Trends in Microelectronics, Automation, Computing and Communications Systems (ICMACC)* (pp. 134-139). IEEE.

**Abstract:** The integration of artificial intelligence (AI) in education has revolutionized adaptive learning technologies and greatly supports the learners with disabilities. This study explores how AI solutions help make education more inclusive by addressing challenges related to mental, visual, and hearing impairments. By reviewing existing research and survey data, we highlight tools like speech-to-text applications, intelligent tutoring systems, and personalized platforms that improve learning experiences for students with disabilities. Key AI tools—such as speech-to-text applications, language translation services, intelligent tutoring systems, and personalized learning platforms—are crucial in meeting the diverse needs of students. Moreover, the study addresses the ethical, technical, and adoption challenges that are associated with the integration of AI in educational settings. These include the issues of privacy, algorithmic bias, and the need for adequate training for educators. The paper offers recommendations for policymakers, educators, and researchers encouraging the development and responsible adoption of these technologies to ensure disabled students have the same academic opportunities as their non-disabled peers. Additionally, the findings highlight the necessity for increased awareness and education on current AI trends for disabled children to maximize the benefits of these technologies. This paper contributes to the ongoing discourse on AI in education and disability studies, advocating for a future where AI-powered adaptive learning technologies empower all students to reach their full potential.

6. Title: Revolutionizing Inclusion: AI in Adaptive Learning for Students with Disabilities

**Authors:** Habib, H., Jelani, S. A. K., & Najla, S. (2022). Revolutionizing Inclusion: AI in Adaptive Learning for Students with Disabilities. *Multidisciplinary Science Journal*, *1*(01), 1-11.

**Abstract:** This study investigates the potential of Artificial Intelligence (AI) to revolutionize inclusion by providing adaptive learning for learners with special needs with unique learning needs and challenges which were often past redress, AI driven solutions have created new realms in personalized education. Machine learning and natural language processing aspects within adaptive learning technologies allow for instructional practices to be personalized according to various disabilities visual, auditory, or cognitive impairments. AI also enables the curriculum to be delivered in real time by studying single students learning process and their likes and dislikes, hence providing equality in education. The review focuses on insightful innovations, such as speech to text systems, virtual assistants, and gamified learning platforms, that increase accessibility and engagement. The syllabus further interrogates ethical issues of data privacy, algorithmic bias, and the just distribution of technology. It closes by emphasizing the importance of interdisciplinary collaboration among educators, technologists and policymakers to scale AI driven adaptive learning tools and support a holistic education ecosystem that works for every learner with different abilities.

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7. Title: Impact of Artificial Intelligence in Special Need Education to Promote Inclusive Pedagogy

**Authors:** Garg, S., & Sharma, S. (2020). Impact of artificial intelligence in special need education to promote inclusive pedagogy. *International Journal of Information and Education Technology*, *10*(7), 523-527.

**Abstract:** Artificial Intelligence (AI) and technology has already touched the life of individuals, more generally, it has influenced educational sector to make it more inclusive and accessible for students with visual, hearing, mobility and intellectual disabilities. The use of AI has not only impacted students with special needs, but has also impacted educational institutions in creating inclusive pedagogies. The present study is a working paper that has tried to analyze how AI has impacted education for students with special needs. The data collection was based on qualitative research that was conducted using focused interviews from teachers and students with special needs. The data was also collected through literature present in the academic databases EBSCO that comprised of Web of Science, Scopus and Science Direct, newspapers, magazines, blogs. The responses obtained were analyzed using Content Analysis. The study in particular focused on whether the literature covered the theme of analyzing the impact of AI on (a) Special Need Education; (b) AI helping teachers to promote special need education. The study also tried to propose the framework for an inclusive future of Special Need Education based on focused interview.

8. Title: Artificial Intelligence in Science and Mathematics Assessment for Students with Disabilities: Opportunities and Challenges

**Authors:** Clark, A. K., Hirt, A., Whitcomb, D., Thompson, W. J., Wine, M., & Karvonen, M. (2025). Artificial Intelligence in Science and Mathematics Assessment for Students with Disabilities: Opportunities and Challenges. *Education Sciences*, *15*(2), 233.

**Abstract:** Emerging developments in artificial intelligence present significant opportunities to enhance equity and access to science and mathematics assessment content for students with disabilities. Artificial intelligence (AI) technologies may have the potential to support test developers in creating more inclusive assessments that better measure what students know and can do. But they must also consider the potential accessibility challenges or introduction of construct-irrelevant variance posed by these technologies. The purpose of this article is to provide a conceptual overview of the issues to be considered when creating and implementing large-scale science and mathematics assessments for students with disabilities. We discuss how AI has been utilized in large-scale assessments to date and describe the opportunities and potential pitfalls in the stages of the process: assessment design, development, administration, scoring, reporting, and data use. This article concludes with proposed priorities for research that will advance the responsible practice of AI in large-scale assessment that is inclusive, fair, and valid for students with disabilities. This article contributes to the growing body of information on AI applications for assessment by identifying the roles that AI can play in science and mathematics assessment practices and demonstrating how AI can inform approaches to equitable science, technology, engineering, and mathematics (STEM) learning.

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9. Title: Understanding the role of study strategies and learning disabilities on student academic performance to enhance educational approaches: A proposal using artificial intelligence

**Authors:** Bressane, A., Zwirn, D., Essiptchouk, A., Saraiva, A. C. V., de Campos Carvalho, F. L., Formiga, J. K. S., ... & Negri, R. G. (2024). Understanding the role of study strategies and learning disabilities on student academic performance to enhance educational approaches: A proposal using artificial intelligence. *Computers and Education: Artificial Intelligence*, *6*, 100196.

**Abstract:** The students' academic performance is influenced by a complex interplay among several factors. Traditional educational approaches often struggle to accommodate the diverse needs of students, leading to suboptimal learning outcomes. This article aims to comprehensively understand the role of study strategies and learning disabilities in shaping academic performance. Through the integration of artificial intelligence (AI) tools, the purpose is to propose a decision support system (DSS) for recommendations to improve the educational approach. To identify features with higher explanatory power based on empirical data, we employed an artificial neural network (ANN) to recognize patterns of association between study strategies, learning disabilities, and academic performance. Using the pondered features, a Fuzzy-based AI was built for offering recommendations into effective educational interventions. The findings underscore the significance of study strategies in mitigating the negative impact of learning disabilities on academic performance. By leveraging the proposed AI tools framework, educators can make informed decisions to tailor educational approaches, catering to the unique cognitive profiles of students. Personalized interventions based on identified patterns can lead to improved academic outcomes and greater inclusivity in the learning environment. Educators and policymakers can adopt the proposed data-driven strategies to enhance teaching methodologies, thereby accommodating the varying needs of students with learning disabilities. This approach fosters a more inclusive and equitable educational landscape, promoting academic success for all learners.

10. Title: AI for Students with Learning Disabilities: A Systematic Review

**Authors:** Panjwani-Charania, S., & Zhai, X. (2023). AI for students with learning disabilities: A systematic review.

**Abstract:** This review study aims to uncover how artificial intelligence (AI) has been employed to support students with learning disabilities (SWLDs). Of the 16 reviewed studies, 10 were focused on dyslexia, with only one focused on dyscalculia and the remaining fo- cused on learning disabilities in general. The study suggests that only 50% of studies focused on school-age children. Seven types of AI applications were used to support SWLDs, including adaptive learning, facial expression, chat robots, communication as- sistants, mastery learning, intelligent tutors, and interactive robots. Adaptive learning was the most widely used. Employing the SAMR-LD (i.e., substitute, augment, modify, and redefine—learning disability) model, we found that AI had been utilized in various ways to support SWLDs (4 substitution, 6 augmentation, 2 modification, and 4 redefinition lev- els). Findings revealed the potential of AI in supporting SWLDs, but the small number of empirical studies also implies significant gaps and the need for more research on how AI can support SWLDs beyond just identifying and diagnosing a learning disability.

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11. Title: Special Education Teachers' Perceptions of Using Artificial Intelligence in Educating Students with Disabilities

**Authors:** Alsudairy, N. A., & Eltantawy, M. M. (2024). Special Education Teachers' Perceptions of Using Artificial Intelligence in Educating Students with Disabilities. *Journal of Intellectual Disability-Diagnosis and Treatment*, *12*(2), 92-102.

**Abstract:** Artificial intelligence technologies improve the learning environment; in the near future, they are expected to provide great benefits for students and teachers, in general, and for those with disabilities and their teachers, in particular. This research has aimed at identifying the perceptions of special education teachers about the use of artificial intelligence in teaching students with disabilities as well as identifying the impact of some variables, such as the number of years of experience, disability category, or the school stage, on these perceptions. The research was based on the descriptive approach. The research sample consists of 301 male and female teachers of students with disabilities from Riyadh, Kingdom of Saudi Arabia. It includes 138 males and 163 females, divided into a group of special education programs. The research used a questionnaire on the perceptions of special education teachers about the use of artificial intelligence in educating students with disabilities. The research findings showed that these teachers' perceptions were mostly neutral, that there are differences in their perceptions due to the number of years of experience, and that there are no differences in their perceptions due to the disability category or school stage variable. As artificial intelligence is considered one of the modern variables in the field of education for people with disabilities in the Arab environment, it is expected to support personal education, assistive technologies, data-based decision-making when teaching people with disabilities, and promoting inclusion. The research also presented a questionnaire identifying special education teachers' perceptions of artificial intelligence.

12. Title: Using Universal Design for Learning and Artificial Intelligence to Support Students with Disabilities

**Authors:** Hyatt, S. E., & Owenz, M. B. (2024). Using Universal Design for Learning and artificial intelligence to support students with disabilities. *College Teaching*, 1-8.

**Abstract:** This paper explores whether Universal Design for Learning (UDL) can be combined with Artificial Intelligence (AI) to create a more inclusive pedagogy for students with disabilities. Two graduate level courses in Student Affairs with a combined enrollment of 37 students completed an AI-based assignment and provided survey data and artifacts of learning to assess student perception and academic impact. The sample reported higher than average rates of disabilities with over 30% reporting a learning disability and 43% reporting qualifying for disability services. The assignment was designed with principles of UDL to specifically consider the unique needs of students with learning disabilities, especially those with difficulty reading or writing, for whom AI may be particularly helpful. Therefore, following UDL standards, students were given multiple options to demonstrate learning by critiquing an AI output by rewriting the output, commenting on the output, or providing a video critique of the output. Interestingly, students were roughly evenly distributed in their selection of the assessment options, suggesting that the options are well-utilized and may be related to the high representation of disability in the classroom sample. Students reported overall satisfaction with an AI-based assignment with UDL options built-in.