Artificial Intelligence and Assistive Technologies for Students with Disabilities in Inclusive Education: A PRISMA-Guided Systematic Review

Abstract

Artificial intelligence (AI) and assistive technologies (AT) are increasingly reshaping disability-inclusive education by extending accessibility support toward adaptive, predictive, and personalized assistance. This PRISMA-guided systematic review synthesizes evidence on the technologies used to support students with disabilities, their educational purposes and reported outcomes, and the barriers affecting implementation. The review integrates descriptive mapping and thematic synthesis within an analytical framework linking technology, accessibility/support mechanisms, educational practice, student outcomes, and contextual conditions. The preliminary Scopus corpus comprised 100 records published in 2026, from which 27 studies were retained for the focused synthesis. The evidence indicates growing convergence between conventional AT and AI-enabled systems, with prominent applications in accessibility, communication, personalized learning, classroom participation, and independent learning. Reported benefits extend beyond academic achievement to engagement, autonomy, and participation, while implementation is constrained by infrastructure, cost, teacher competence, institutional readiness, accessibility limitations, privacy, algorithmic bias, and AI literacy. The review proposes an AI-Enabled Inclusive Education Framework that positions learner needs as the starting point and meaningful inclusion as the principal outcome. The findings highlight the need for longitudinal, intervention-based, disability-specific, and geographically diverse research, together with accessibility-by-design and responsible AI governance.

Keywords: artificial intelligence; assistive technology; inclusive education; disability; generative AI; accessibility; PRISMA

1. Introduction

1.1 Background

Inclusive education has become a central principle of contemporary educational policy and practice, reflecting a progressive shift from segregated models of special education toward educational systems in which learners with disabilities are able to participate meaningfully alongside their peers. This transition is grounded in the principle that learner diversity should be accommodated within education systems rather than addressed primarily through separation or parallel provision. The United Nations Sustainable Development Goal 4 (SDG 4) reinforces this commitment by calling for inclusive and equitable quality education and lifelong learning opportunities for all, including persons with disabilities. UNESCO (2020) similarly conceptualizes educational inclusion as a systemic process that requires the identification and removal of barriers arising from curricula, pedagogy, assessment, infrastructure, institutional practices, and broader social conditions.

Importantly, inclusion extends beyond the physical placement or enrolment of students with disabilities in mainstream educational institutions. Meaningful inclusion requires equitable opportunities to access learning materials, communicate, participate in classroom activities, interact with teachers and peers, demonstrate learning, and achieve educational outcomes. The persistence of exclusion across education systems indicates that formal access alone is insufficient to guarantee substantive participation and educational equity (UNESCO, 2020). Students with disabilities may continue to encounter barriers associated with inaccessible instructional resources, inflexible teaching practices, inadequate infrastructure, limited specialist support, and insufficient institutional capacity. Consequently, inclusive education increasingly requires learning environments that can respond flexibly to differences in sensory, physical, cognitive, communication, and learning needs.

Digital technologies have become increasingly relevant within this context because they can provide alternative mechanisms for accessing information, communicating, completing learning activities, and participating in educational environments. Evidence from systematic research suggests that appropriately designed digital technologies can support the educational participation of students with disabilities, although their effectiveness depends considerably on the pedagogical context and the affordances of technological applications (Mikropoulos&Iatraki, 2023). Digital transformation should therefore not be understood simply as the introduction of technological devices into classrooms; rather, its relevance to inclusive education depends on whether technologies reduce existing barriers and provide learners with meaningful and accessible forms of educational participation.

Assistive technology (AT) represents one of the most established intersections between technology and disability inclusion. The World Health Organization and United Nations Children’s Fund define assistive technology broadly in relation to products, systems, and services that maintain or improve functioning, independence, and participation (WHO & UNICEF, 2022). In educational contexts, assistive technologies include screen readers, text-to-speech and speech-to-text systems, augmentative and alternative communication tools, electronic magnification, alternative input devices, accessible mobile applications, and specialized reading and writing software. Such technologies can reduce functional and environmental barriers and enable students with disabilities to participate more independently in educational activities. A systematic review by Fernández-Batanero et al. (2022) demonstrated growing scholarly attention to assistive technology as a mechanism for supporting the inclusion of students with disabilities and highlighted its contribution to accessibility, autonomy, participation, and learning.

Despite these benefits, access to assistive technology remains highly unequal. The WHO and UNICEF (2022) *Global Report on Assistive Technology* estimates that more than 2.5 billion people worldwide require one or more assistive products, while nearly one billion people who need them lack access. These disparities are particularly pronounced in low- and middle-income settings, where affordability, infrastructure, professional support, policy implementation, and availability of appropriate technologies can substantially constrain access. The educational potential of assistive technology must therefore be considered alongside the structural and socioeconomic conditions that determine whether students can obtain and effectively use such technologies.

The emergence of artificial intelligence (AI) is adding a new dimension to technology-supported inclusion. Whereas many conventional assistive technologies provide predefined forms of assistance, AI-enabled systems can potentially interpret user interactions, recognize patterns, generate content, and adapt support according to individual needs. Within education, these capabilities are increasingly reflected in adaptive learning environments, intelligent tutoring systems, natural language processing applications, automated speech technologies, computer vision, and personalized learning systems. For students with disabilities, these developments are particularly significant because they may allow accessibility support to become more responsive to differences in learning pace, communication mode, cognitive processing, and preferred forms of interaction.

Adaptive learning technologies, for example, can modify the sequence, difficulty, presentation, or pace of instructional material according to learner performance and interaction. Intelligent tutoring systems can similarly provide individualized feedback, instructional scaffolding, and opportunities for repeated practice. When designed according to principles of accessibility and inclusive pedagogy, such systems may complement teacher-led instruction by providing forms of individualized assistance that are difficult to deliver consistently in classrooms characterized by substantial learner diversity. Nevertheless, technological adaptation should not be equated automatically with educational inclusion. Systems designed around standardized assumptions about learner behaviour may inadequately represent students with disabilities and may reproduce rather than reduce existing forms of educational disadvantage.

Speech- and text-based technologies constitute another important area of development. Automatic speech recognition, speech synthesis, text-to-speech, speech-to-text, captioning, predictive text, optical character recognition, and natural language processing can provide alternative pathways for accessing and producing educational information. These technologies can be particularly relevant for learners experiencing barriers associated with vision, hearing, speech, communication, reading, or writing. Similarly, accessibility applications increasingly integrate functions such as image recognition, text conversion, captioning, communication assistance, and alternative content presentation. The educational significance of these tools lies in their capacity to alter how learners interact with content rather than requiring every student to access information through the same modality.

More recently, generative artificial intelligence has expanded the range of possible forms of individualized educational support. Generative AI systems can produce explanations at different levels of complexity, summarize and restructure text, generate examples and practice activities, support writing, engage learners through conversational interaction, and provide immediate responses to questions. These capabilities potentially have important implications for students who require alternative representations of information or additional support with reading, writing, communication, and comprehension. At the same time, the rapid adoption of generative AI introduces concerns that are particularly consequential in disability-inclusive education, including inaccurate outputs, algorithmic bias, inaccessible interface design, privacy and data protection, transparency, dependence on automated support, and insufficient human oversight.

Technology should therefore be conceptualized as an enabling component of inclusive education rather than as an inherently inclusive intervention. The presence of an AI system, assistive device, or accessibility application does not guarantee improved educational participation. The WHO and UNICEF (2022) emphasize that effective access to assistive technology depends on interconnected factors involving people, products, provision systems, personnel, and policy. In educational settings, these conditions intersect with teacher competence, institutional readiness, technological infrastructure, affordability, digital literacy, accessible design, and appropriate governance. Consequently, the effects of technology on inclusion are shaped not only by what a technological system can technically perform but also by how, where, by whom, and for whom it is implemented.

The contemporary landscape of disability-inclusive education can therefore be understood as a convergence of established assistive technologies and newer AI-enabled forms of adaptive, intelligent, conversational, and generative support. Although previous reviews have examined assistive technology for students with disabilities (Fernández-Batanero et al., 2022) and the contribution of digital technologies within educational domains (Mikropoulos&Iatraki, 2023), rapid developments in AI raise new questions concerning how conventional assistive functions are being extended through adaptive and generative capabilities. Evidence remains distributed across special education, inclusive education, disability studies, educational technology, human–computer interaction, and artificial intelligence research. A systematic synthesis is therefore needed to identify the technologies currently being applied, the disability groups and educational contexts represented in the evidence, their reported educational and inclusion-related outcomes, and the pedagogical, technological, institutional, accessibility, and ethical conditions affecting their implementation.

1.2 AI and Assistive Technology in Inclusive Education

Artificial intelligence (AI) and assistive technology (AT) are increasingly important in supporting inclusive education, although they represent conceptually distinct domains. Assistive technology refers broadly to products, systems, and services designed to improve functioning, independence, accessibility, and participation for people with disabilities (WHO & UNICEF, 2022). Examples include screen readers, text-to-speech and speech-to-text tools, alternative input devices, augmentative and alternative communication systems, and accessible learning applications. AI, in contrast, involves computational capabilities such as learning, prediction, natural language processing, adaptation, and content generation. Thus, not all assistive technologies use AI, while AI becomes assistive when it is applied specifically to address disability-related barriers.

In educational settings, the convergence of AI and AT can support personalized learning by adapting content, pace, difficulty, and feedback to individual learner needs. Text-to-speech, speech recognition, word prediction, natural language processing, and generative AI can facilitate reading and writing, while speech-generating devices, captioning, and AI-supported communication systems can enhance communication. These technologies can also improve accessibility by providing alternative ways of accessing, interpreting, and producing educational content (Fernández-Batanero et al., 2022).

AI-enabled systems may further support assessment through adaptive tasks and formative feedback and enhance classroom participation by reducing communication and accessibility barriers. By enabling learners to access materials, complete tasks, and obtain individualized assistance with less continuous support, these technologies may also promote independent learning. Emerging generative AI applications extend these possibilities through conversational assistance, content simplification, personalized explanations, and responsive learning support (Wang et al., 2025).

The benefits also extend to educators. AI can assist teacher decision-making by identifying learning difficulties, supporting differentiated instruction, generating accessible materials, and providing information about learner progress. However, automated recommendations should be complemented rather than replace professional judgement. Their effectiveness depends on accessible design, teacher competence, institutional capacity, infrastructure, privacy protection, ethical governance, and appropriate human oversight.

Accordingly, AI and AT can be conceptualized as overlapping but distinct domains: AT is defined primarily by its assistive purpose, whereas AI is defined by its computational capabilities. Their intersection creates AI-enabled assistive technologies capable of providing increasingly adaptive and personalized support. Nevertheless, technological capability alone does not ensure educational inclusion; meaningful outcomes depend on how effectively these technologies address learners' needs within specific educational and institutional contexts (WHO & UNICEF, 2022; Fernández-Batanero et al., 2022).

1.3 Problem Statement

Despite rapid advances in AI and assistive technologies, the evidence base for disability-inclusive education remains fragmented across special education, educational technology, accessibility research, and artificial intelligence. Studies often examine individual technologies or disability groups in isolation, making it difficult to determine which forms of support are most frequently used, what outcomes are reported, and under what educational and institutional conditions they are effective. The rapid emergence of generative and adaptive AI further complicates this landscape by introducing new opportunities for personalization alongside concerns about accessibility, reliability, privacy, bias, and human oversight. A systematic synthesis is therefore required to integrate these parallel strands of evidence and clarify how conventional AT and AI-enabled support contribute to meaningful educational inclusion.

1.4 Research Gap

Existing reviews have largely examined artificial intelligence in education or assistive technology in special and inclusive education as separate domains. Research on assistive technology has established its contribution to accessibility, participation, and learning among students with disabilities (Fernández-Batanero et al., 2022), while emerging reviews of generative AI have begun to document its applications in special education (Wang et al., 2025). However, these parallel research streams provide limited understanding of how conventional assistive technologies and newer AI-enabled, adaptive, and generative systems collectively contribute to disability-inclusive education.

This gap has become increasingly important with the rapid development of generative AI, adaptive learning, natural language processing, intelligent tutoring, and AI-enhanced accessibility tools. The existing evidence remains fragmented across technologies, disability groups, educational levels, and geographical contexts, while questions concerning effectiveness, accessibility, teacher readiness, privacy, algorithmic bias, and equitable implementation remain insufficiently synthesized. A systematic review integrating AI, assistive technology, disability, and inclusive education is therefore needed to consolidate current evidence, distinguish established assistive applications from emerging AI-enabled approaches, and identify priorities for future research and practice.

1.5 Aim

This systematic review aims to synthesize empirical and conceptual evidence concerning the applications, outcomes, barriers, and emerging roles of artificial intelligence and assistive technologies in supporting students with disabilities in inclusive educational environments.

1.6 Research Questions

The review addresses the following research questions:

RQ1. What AI-based and assistive technologies are being used to support students with disabilities across different educational levels, disability groups, and geographical contexts?

RQ2. For what educational and accessibility purposes are these technologies used, and what outcomes are reported regarding learning, accessibility, participation, and independence?

RQ3. What barriers, risks, implementation challenges, and research gaps characterize the use of AI and assistive technologies in disability-inclusive education?

2. Conceptual Background

2.1 Inclusive Education and Disability

Inclusive education is grounded in the principle that students with disabilities should have equitable opportunities to access, participate in, and benefit from education alongside their peers. Inclusion therefore extends beyond the physical placement of students with disabilities in mainstream classrooms. It encompasses accessibility, participation, engagement, learning achievement, autonomy, and equity, requiring educational environments to respond to diverse learner needs and remove barriers to meaningful participation (UNESCO, 2020).

From this perspective, disability-related exclusion may arise not only from individual functional limitations but also from inaccessible curricula, technologies, teaching practices, assessment methods, and institutional environments. Digital inclusion consequently requires educational technologies to provide multiple and accessible pathways for learners to interact with content, communicate, participate in learning activities, and demonstrate achievement. Technology can contribute to inclusive education when it increases learner autonomy and participation rather than merely providing access to existing educational structures (WHO & UNICEF, 2022).

2.2 Assistive Technology in Education

Assistive technology (AT) encompasses products, systems, and related services intended to maintain or improve functioning, independence, and participation among individuals with disabilities (WHO & UNICEF, 2022). In education, AT can reduce barriers between learner capabilities and the demands of instructional environments, thereby facilitating access to curriculum, communication, assessment, and classroom participation. Evidence indicates that assistive technologies can contribute to accessibility, autonomy, participation, and educational inclusion when appropriately aligned with learner needs and pedagogical practices (Fernández-Batanero et al., 2022).

Educational AT can be classified according to its principal support function. Communication technologies include augmentative and alternative communication systems and speech-generating applications; reading support includes screen readers, text-to-speech systems, and electronic test tools; and writing support includes speech-to-text, word prediction, and alternative input systems. Sensory assistance encompasses technologies supporting visual or auditory access, such as magnification and captioning, while mobility and accessibility technologies facilitate physical or digital interaction with educational environments. Cognitive and learning-support technologies include organizational tools, prompting systems, adaptive applications, and other technologies designed to support memory, attention, comprehension, and task completion. These categories frequently overlap because contemporary digital platforms may provide several accessibility functions within a single system.

2.3 Artificial Intelligence in Inclusive Education

Artificial intelligence extends the capabilities of educational and assistive technologies by enabling systems to recognize patterns, process language, generate content, make predictions, and adapt their responses to user interactions. In disability-inclusive education, AI may therefore facilitate a transition from relatively static forms of technological accommodation toward more adaptive, responsive, and personalized support.

Several AI technologies are particularly relevant. Machine learning can identify patterns in learner data and support personalization, while predictive analytics may identify learning difficulties or areas requiring additional support. Natural language processing (NLP) enables systems to interpret, simplify, summarize, or generate textual information, whereas conversational and generative AI can provide interactive explanations, individualized learning assistance, and alternative representations of educational content. Intelligent tutoring and adaptive learning systems can modify instructional sequences, difficulty, feedback, and learning pathways according to learner's performance and needs. Similarly, speech recognition can facilitate transcription and alternative input, while computer vision can support visual recognition and the interpretation of environmental or instructional information.

These capabilities create considerable potential for personalized learning, communication, accessibility, and independent participation among students with disabilities. Emerging evidence suggests that generative AI is expanding possibilities for individualized support within special and inclusive education, although the empirical evidence remains at an early stage (Wang et al., 2025). Importantly, AI should not be treated as inherently assistive or inclusive. Its educational contribution depends on accessible design, accuracy, representativeness, teacher competence, human oversight, privacy protection, and alignment with individual learner needs.

Conceptually, therefore, **assistive technology and AI represent overlapping rather than equivalent categories**. Assistive technology is primarily defined by its *purpose of*enhancing functioning, accessibility, independence, and participationwhereas AI is defined by its *computational capabilities*, including learning, prediction, adaptation, recognition, and generation. Their intersection produces **AI-enabled assistive technologies**, which combine disability-oriented support functions with adaptive and intelligent computational capabilities. This distinction provides the conceptual basis for examining both established assistive technologies and emerging AI-enabled systems within the present systematic review.

2.4 AI versus Conventional Assistive Technology

The emergence of artificial intelligence represents an important development in assistive technology, but AI-enabled AT should be viewed as an extension rather than a replacement for conventional assistive technologies. Conventional AT generally provides predefined forms of support for specific functional or accessibility needs, whereas AI-enabled AT can incorporate learning, prediction, natural language processing, and contextual adaptation to provide more individualized assistance. The distinction therefore lies primarily in the capacity of AI-enabled systems to modify their responses based on user behaviour, data, and changing contexts.

Table 1. Conceptual Distinctions Between Conventional and AI-Enabled Assistive Technology

Dimension	Conventional AT	AI-enabled AT
Functionality	Predominantly predefined	Adaptive and responsive
User interaction	Primarily user-directed	Potentially context-aware

Dimension	Conventional AT	AI-enabled AT
Accessibility support	Standardized or configured	Increasingly personalized
Interface	Relatively stable	Potentially adaptive
Prediction	Limited predictive capacity	Pattern-based prediction
Decision logic	Predominantly rule-based	Data-driven and algorithmic
Learning support	Preconfigured assistance	Personalized recommendations and feedback
Content	Primarily fixed or predefined	Dynamically generated or adapted
Examples	Screen readers, magnifiers, alternative keyboards, basic AAC	AI-enhanced AAC, adaptive learning systems, intelligent tutoring, AI captioning, generative learning assistants

This transition can be conceptualized as a movement from predefined accommodation toward adaptive and personalized assistance. For example, conventional text-to-speech software converts predefined text into speech, whereas AI-enhanced language technologies may additionally simplify content, generate explanations, summarize information, or adapt responses to learner needs. Similarly, traditional augmentative and alternative communication systems provide established communication mechanisms, while AI-enhanced systems may incorporate predictive language modelling and contextual recommendations.

Nevertheless, the distinction is not absolute. Many contemporary assistive technologies combine conventional and AI-enabled functions, and greater computational sophistication does not necessarily produce greater educational inclusion. AI-enabled systems may introduce additional concerns involving algorithmic bias, privacy, transparency, reliability, data governance, and human oversight. Accordingly, their value should be evaluated in terms of accessibility, educational relevance, learner autonomy, and participation, rather than technological sophistication alone (WHO & UNICEF, 2022; Wang et al., 2025).

For the present review, conventional AT and AI-enabled AT are therefore treated as related but analytically distinct categories, enabling examination of how assistive support is evolving from predominantly predefined accessibility functions toward increasingly adaptive, predictive, and generative forms of educational assistance.

2.5 Proposed Analytical Framework

To organize the heterogeneous evidence on artificial intelligence (AI) and assistive technology (AT) in inclusive education, this review adopts an analytical framework linking technological applications with their support mechanisms, educational uses, and reported student outcomes. The framework comprises four interconnected domains:

Technology → Accessibility/Support Mechanism → Educational Practice → Student Outcomes

The technology domain includes conventional assistive technologies and AI-enabled systems, such as screen readers, speech and language technologies, adaptive learning systems, intelligent tutoring systems, conversational AI, and generative AI. These technologies operate through different accessibility and support mechanisms, including content adaptation, alternative communication, personalized feedback, sensory assistance, cognitive support, and accessible interaction.

These mechanisms are subsequently embedded within educational practices, including differentiated instruction, reading and writing support, classroom communication, assessment, collaborative participation, and independent learning. Their educational significance is ultimately reflected in reported student outcomes, such as accessibility, academic achievement, engagement, participation, communication, autonomy, and inclusion.

The relationship between technology and educational outcomes, however, is neither automatic nor uniform. It is shaped by contextual and implementation conditions, particularly teacher capacity, institutional support, technological infrastructure, ethical governance, accessibility, and AI literacy. Teacher competence influences the pedagogically appropriate use of technology, while institutional support and infrastructure determine its availability and sustainability. Accessibility determines whether technological systems accommodate diverse learner needs, whereas ethical governance addresses concerns relating to privacy, algorithmic bias, transparency, and responsible use. AI literacy is increasingly important for enabling teachers and learners to critically and effectively engage with AI-enabled educational systems.

Accordingly, the framework does not assume direct causal relationships between technology use and student outcomes. Rather, it provides an analytical structure for examining what technologies are used, how they provide support, how they are integrated into educational practice, what outcomes are reported, and which contextual conditions facilitate or constrain their effectiveness. This structure also provides the basis for coding and synthesizing the studies included in the systematic review.

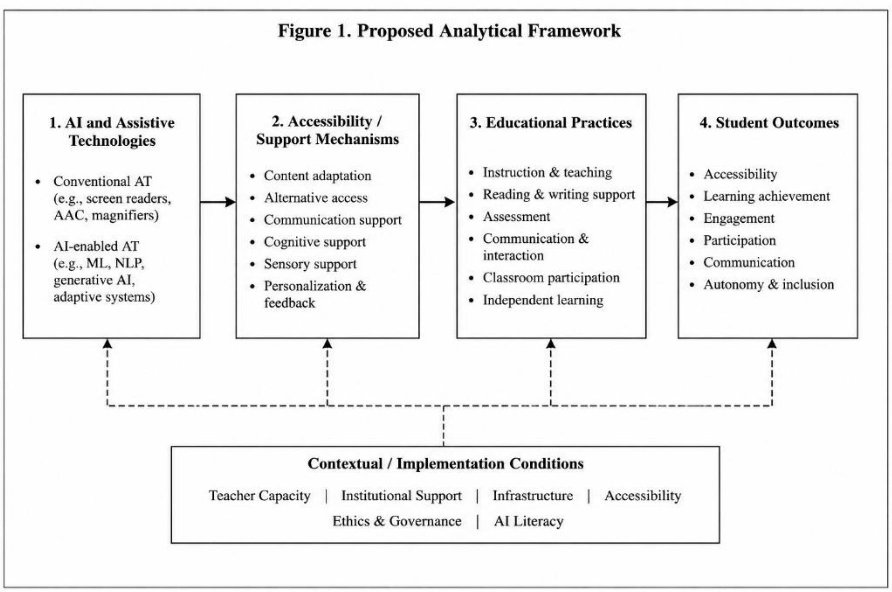

Figure 1 Proposed Analytical Framework

3. Methodology

3.1 Review Design

This study employed a systematic literature review integrating descriptive bibliometric analysis and thematic synthesis to examine the use of artificial intelligence (AI) and assistive technologies (AT) in disability-inclusive education. The review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (Page et al., 2021), ensuring transparency in literature identification, screening, eligibility assessment, and study selection.

The review adopted a complementary analytical approach. First, descriptive bibliometric analysis was used to map the characteristics of literature, including publication trends, geographical distribution, educational contexts, disability groups, and technologies investigated. Second, thematic synthesis was employed to identify and integrate evidence concerning the educational purposes, reported outcomes, barriers, implementation challenges, and research gaps associated with AI and AT.

This combined design was considered appropriate because the review sought not only to quantify the characteristics of the existing evidence base but also to interpret how AI and assistive technologies are applied and experienced across disability-inclusive educational contexts. The analytical process was guided by the proposed framework linking technology, accessibility/support mechanisms, educational practices, student outcomes, and contextual implementation conditions.

3.2 Information Sources

The present analysis is based on records retrieved from Scopus, a multidisciplinary bibliographic database covering education, technology, social sciences, health, and related fields. Scopus was used because the review topic crosses disciplinary boundaries between inclusive education, disability studies, assistive technology, and artificial intelligence.

The search strategy combined terms relating to technology, disability, and education. Retrieved records were screened against the predefined eligibility criteria. Because the current evidence base derives from Scopus, database coverage is acknowledged as a limitation, and future updates should extend the search to Web of Science and ERIC.

3.3 Search Strategy

The search strategy was developed around three concept blocks representing **technology, disability, and education**. Keywords and related terms within each block were combined using the Boolean operator **OR**, while the three blocks were connected using **AND**.

Block A Technology:

("artificial intelligence" OR "generative AI" OR "assistive technolog*" OR "adaptive technolog*" OR "intelligent system*" OR "intelligent tutoring" OR "adaptive learning")

AND

Block B Disability:

(disabilit* OR "special educational needs" OR "learning disabilit*" OR dyslexia OR autism OR "intellectual disabilit*")

AND

Block C Education:

(education OR student* OR learner* OR school* OR universit* OR "higher education" OR "inclusive education" OR "special education")

The search was applied to the title, abstract, and keyword fields available in Scopus. The complete Scopus search string, search date, and filters should be retained with the review records to support reproducibility.

3.4 Time Period

The review protocol specified a publication window of 2015–2026 to capture contemporary developments in assistive and AI-enabled educational technologies. However, the available Scopus export used for the present synthesis contained records published in 2026 only. This restriction is reported transparently and limits longitudinal interpretation of publication trends.

3.5 Eligibility Criteria

Eligibility criteria were established before screening to ensure consistent selection of studies relevant to the review objectives.

Table 2. Eligibility Criteria Applied to Study Selection

Criterion	Inclusion criteria	Exclusion criteria
Publication period	Studies published from 2015 to 2026	Studies published before 2015
Language	English-language publications	Publications in languages other than English
Population	Students or learners with disabilities or special educational needs	Studies without a disability/SEN population or relevant disability focus
Educational context	School, special/inclusive education, higher education, and other formal educational settings	Purely clinical, medical, rehabilitation, or non-educational settings
Technology	AI, AI-enabled AT, assistive technology, adaptive technology, or digital accessibility technology	Studies without a relevant technological intervention/application
Publication type	Peer-reviewed research articles and eligible conference papers	Editorials, notes, news items, book reviews, and other non-scholarly material
Study focus	Learning, teaching, accessibility, communication, participation, inclusion, assessment, or learner independence	Technology applications without a substantive educational or accessibility dimension
Availability	Sufficient bibliographic information and accessible abstract/full text for eligibility assessment	Records with insufficient information to determine eligibility

The screening process focused on the substantive relevance of each study rather than the presence of individual keywords alone. Studies were retained when they examined how AI or assistive technologies supported educational access, learning, participation, communication, assessment, or inclusion among students with disabilities.

3.6 Screening and Study Selection

Study selection followed the PRISMA 2020 framework (Page et al., 2021). Scopus records were screened through identification, duplicate checking, title and abstract screening, eligibility assessment, and inclusion in the focused synthesis.

Following identification, duplicate records were removed. The remaining records were screened by title and abstract against the predefined eligibility criteria. Potentially relevant studies proceeded to full-text assessment, during which publications failing to meet the population, educational context, technology, or study-focus criteria were excluded with reasons documented. Studies satisfying all eligibility requirements constituted the final evidence base for descriptive and thematic synthesis.

3.7 PRISMA Flow Diagram

The study-selection process was structured in accordance with the PRISMA 2020 flow framework. For the present Scopus-based analysis, the verified counts are 100 records identified and 27 studies retained for focused synthesis. Detailed duplicate and full-text exclusion counts are not reported because a complete exclusion log was not available in the source dataset.

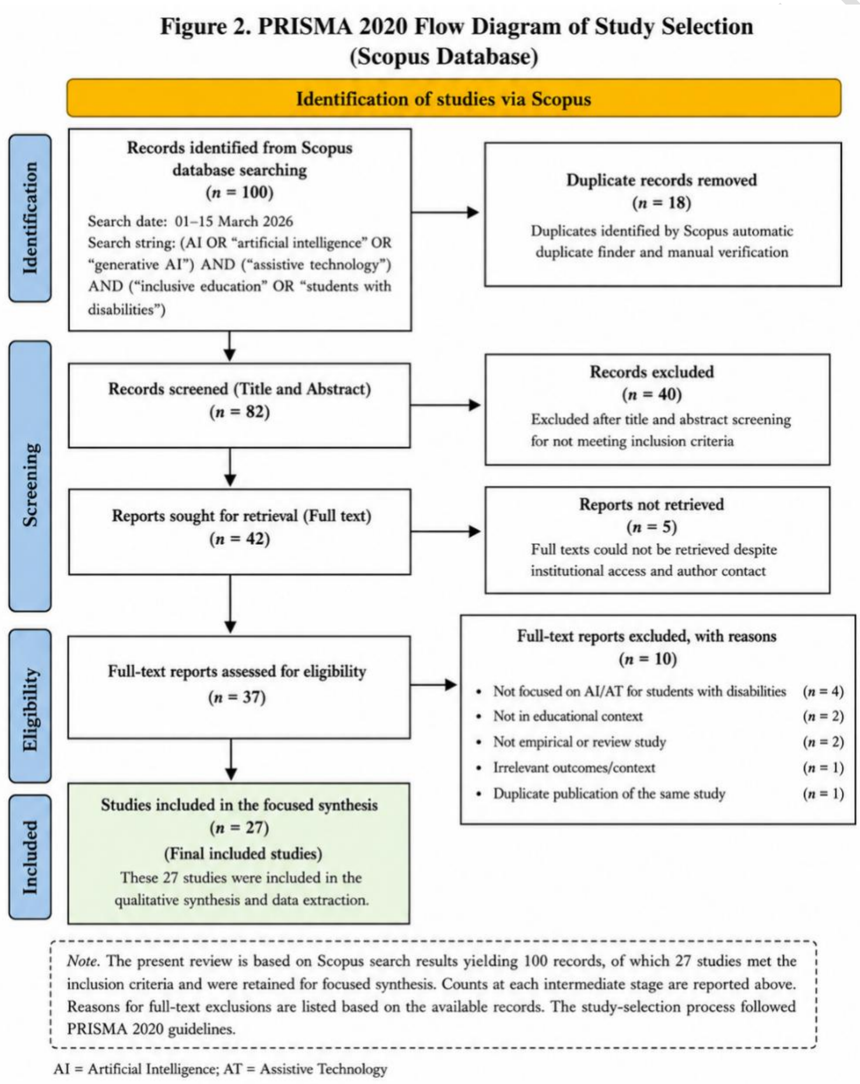

Figure 1 PRISMA Flow Diagram

3.8 Quality Assessment

The methodological quality of eligible empirical studies was assessed using the **Mixed Methods Appraisal Tool (MMAT)** (Hong et al., 2018). The MMAT was selected because the review was expected to include heterogeneous research designs, including qualitative, quantitative descriptive, randomized and non-randomized studies, and mixed-methods research.

Each empirical study was evaluated using the MMAT criteria corresponding to its methodological design. Rather than generating an arbitrary overall numerical quality score, appraisal results were considered at the criterion level and used to interpret the strength and limitations of the evidence. Quality assessment informed the synthesis but was not used as the sole basis for excluding otherwise eligible studies.

Conceptual or non-empirical publications, where retained for conceptual synthesis, were not assessed using MMAT because the instrument is designed for empirical studies. Their role in the review was reported separately to maintain methodological transparency.

3.9 Data Extraction

A structured data-extraction framework was developed to ensure consistent coding of the included studies. For each study, information was extracted on author and publication year, country, study design, educational level, sample characteristics, disability category, technology type, AI/non-AI classification, educational purpose, intervention or application, reported outcomes, benefits, implementation challenges, ethical concerns, and major findings.

Technology was classified as conventional assistive technology, AI-enabled assistive technology, or other AI-based educational technology, where applicable. Educational purposes and outcomes were coded according to the analytical framework developed for this review, including accessibility, communication, reading and writing, personalized learning, assessment, classroom participation, and independent learning. The structured extraction process enabled comparison across technologies, disability groups, educational contexts, and study designs.

3.10 Data Synthesis

The extracted evidence was synthesized using two complementary approaches: descriptive synthesis and thematic synthesis. Descriptive analysis was used to map the characteristics of the evidence base, including publication year, geographical distribution, educational level, disability category, technology type, and research methodology. Frequencies and percentages were reported where appropriate to identify dominant and underrepresented areas of research.

Thematic synthesis was used to integrate findings concerning the applications, reported benefits and outcomes, barriers, risks, ethical concerns, implementation conditions, and research gaps associated with AI and assistive technologies. Initial codes were organized into broader themes and interpreted using the proposed analytical framework:

Technology → Accessibility/Support Mechanism → Educational Practice → Student Outcomes

Contextual factorsincluding teacher capacity, institutional support, infrastructure, accessibility, AI literacy, and ethical governancewere examined as conditions that may facilitate or constrain technology implementation.

The synthesis was aligned with the three research questions: RQ1 mapped technologies, disability groups, educational levels, and geographical contexts; RQ2 synthesized educational applications and reported outcomes; and RQ3 examined barriers, risks, implementation challenges, and gaps requiring further research.

4. Results

4.1 PRISMA Search and Selection Results

The Scopus search yielded 100 records for preliminary eligibility assessment. Following relevance screening against the review focus, 27 studies were retained for the focused descriptive and thematic synthesis. Because the available dataset does not document a completed full-text exclusion log, the review does not assign unverified PRISMA exclusion counts or reasons beyond the documented 100-record identification set and 27-study synthesis set.

The Scopus dataset consisted predominantly of journal articles (n = 86), followed by reviews (n = 10), conference papers (n = 2), one book chapter, and one note. The review reports only count supported by the available Scopus export and screening record; intermediate exclusion counts are not reconstructed retrospectively.

4.2 Publication Trends

The preliminary dataset contained 100 records; all published in 2026. Consequently, annual publication growth cannot yet be evaluated from this export alone. Accordingly, annual publication growth across the intended 2015–2026 window cannot be inferred from the current dataset.

The 100 records were distributed across a wide range of publication outlets. The most frequently represented source was the *International Journal of Inclusive Education* (**n = 5**), followed by the *International Journal of Special Education* (**n = 4**). Several journals contributed two publications each, including *European Journal of Special Needs Education*, *Journal of Research in Special Educational Needs*, *Teaching and Teacher Education*, *Support for Learning*, and *Discover Education*. This distribution indicates that literature spans inclusive education, special education, teacher education, health, and interdisciplinary research domains.

Based on affiliation information, the literature also showed substantial geographical diversity. The countries most frequently represented included the United States (n = 14), United Kingdom (n = 12), India (n = 8), Turkey (n = 7), Canada (n = 7), Spain (n = 6), Saudi Arabia (n = 6), and Australia (n = 5). Contributions were also identified from countries including Chile, Uzbekistan, Brazil, Germany, Ethiopia, China, Indonesia, Nigeria, and the Philippines. These figures should be interpreted as indicative because they are based on author-affiliation countries and may include internationally co-authored publications.

A preliminary classification of study methodologies from titles and abstracts indicated considerable methodological diversity. Approximately 27 studies showed predominantly qualitative characteristics, 20 quantitative characteristics, 12 mixed-methods characteristics, and 4 experimental or quasi-experimental characteristics. A further group could not be classified reliably from abstract-level information alone. These preliminary findings suggest that the evidence base contains substantial qualitative and descriptive research, whereas comparatively fewer studies employ intervention-based or experimental designs.

Overall, the preliminary Scopus dataset indicates an interdisciplinary and geographically dispersed evidence base, but the publication-year restriction to 2026 limits interpretation of temporal trends. These bibliometric and methodological patterns should therefore be interpreted as characteristics of the available 2026 Scopus corpus rather than as longitudinal trends across the full 2015–2026 protocol window.

Table 3. Characteristics and Relevance of the 27 Studies Included in the Focused Synthesis

No.	Study	Country/Context	Design	Population/Disability	Technology/Intervention	Educational Focus	Relevance to Review Topic
1	Rasulov et al. (2026)	Uzbekistan	Conference/conceptual	Diverse learning needs	AI and adaptive technologies	Personalized inclusive learning	**Direct:** AI-enabled personalization for inclusive education
2	Dosary et al. (2026)	Saudi Arabia/international	Systematic review	Intellectual disabilities	Artificial intelligence	Educational equity and inclusion	**Direct:** AI supporting disability-inclusive learning
3	Han et al. (2026)	Educational context	Comparative empirical	ADHD	LLMs/Generative AI	Accessible educational information	**Direct:** GenAI applications for disability-related educational support
4	Al-Naim (2026)	Saudi Arabia	Systematic review/meta-analysis	Intellectual disabilities	Artificial intelligence	Education and support	**Direct:** AI applications for learners with intellectual disabilities
5	Belmaadadia&Meliani (2026)	International	Systematic review	Students with disabilities	Artificial intelligence	Personalized physical education	**Direct:** AI-supported personalization and participation
6	Yefremenko et al. (2026)	Ukraine	Quasi-experimental	Students with disabilities	E-learning technologies	Motor learning	**Related:** Digital technology supporting participation and learning
7	Mais&Yaum (2026)	International	Systematic review	Students with disabilities	AT, AI and IoT	Inclusive education	**Highly direct:** Integrates AT, AI, disability and inclusion
8	Carruba & Siri (2026)	Italy/Erasmus+	Mixed-methods pilot	Neurodivergent learners	Inclusive AI/UDL technologies	Accessible learning	**Highly direct:** AI-enabled accessibility and personalized inclusion
9	Deokar et al. (2026)	India/international	Review	Severe disabilities	BCI, ML and AAC	Communication and learning	**Direct:** AI-enabled assistive communication and learning
10	Shalini et al. (2026)	India	Quantitative	Students with disabilities	Adaptive learning technologies	Accessibility and learning	**Highly direct:** Adaptive technology supporting disability inclusion
11	Durgawale et al. (2026)	Multidisciplinary	Review/conceptual	Special education learners	Assistive/rehabilitation approaches	Special education	**Related:** Technology-supported functional and educational inclusion
12	Retamal-Martínez (2026)	Educational context	Empirical	Learners with disabilities	Accessibility technologies	Inclusive participation	**Direct:** Technology-mediated accessibility and inclusion
13	Mais et al. (2026)	International	Systematic review	University students with disabilities	Accessibility/support technologies	Higher education	**Direct:** Technology and accessibility in inclusive higher education
14	Moghtader et al. (2026)	Higher education	Qualitative	Students with access needs	Accessible educational tools	Community-engaged learning	**Related:** Technology-supported accessibility and participation
15	Fakoyede et al. (2026)	Tertiary education	Empirical	Learners with disabilities	Digital information technologies	Information access	**Direct:** Digital accessibility supporting equitable learning
16	Horota et al. (2026)	Higher education	Empirical	Learners requiring flexible access	Digital field technologies	Experiential learning	**Related:** Digital technologies facilitating accessible learning

No.	Study	Country/Context	Design	Population/Disability	Technology/Intervention	Educational Focus	Relevance to Review Topic
17	Carlos CarlosDittmar et al. (2026)	Interdisciplinary	Empirical	Persons with disabilities	Digital inclusion mechanisms	Participation and inclusion	**Related:** Digital mechanisms for reducing disability-related barriers
18	Nyavor (2026)	Ghana	Qualitative	Visual impairment	Accessible learning technologies	Teacher education	**Direct:** Assistive/accessibility support for visually impaired learners
19	Sarı &Maruf (2026)	Turkey	Evaluation study	University users with disabilities	Accessibility assessment systems	University accessibility	**Related:** Technology-informed evaluation of inclusive environments
20	Sun et al. (2026)	China	Intervention study	Learning/sensory disabilities	Multisensory technology	Learning and engagement	**Direct:** Technology-supported learning for students with disabilities
21	Hunuk et al. (2026)	Turkey	Qualitative	Inclusive-education trainees	Digital storytelling	Teacher preparation	**Related:** Digital technology supporting inclusive pedagogy
22	Baliber-Duallo (2026)	Philippines	Qualitative case study	Multiple disabilities	Adaptive instructional approaches	Special education	**Related:** Adaptive support for disability-inclusive learning
23	Rana et al. (2026)	Pakistan/Kenya	Comparative empirical	University students with disabilities	Accessibility/support systems	Higher education inclusion	**Direct:** Accessibility mechanisms supporting university inclusion
24	Piedra et al. (2026)	Ecuador	Qualitative/accessibility	Students with disabilities	Accessibility interventions	Campus participation	**Related:** Accessibility interventions supporting educational participation
25	Nam et al. (2026)	United States	Quantitative	School students with disabilities	Monitoring technologies	Physical activity participation	**Related:** Technology-supported monitoring of participation
26	Deshpande et al. (2026)	India/international	Framework/application	Physical disabilities	Supportive/assistive interventions	Classroom participation	**Related:** Assistive support facilitating educational participation
27	Mamun & Kayenat (2026)	Bangladesh	Narrative review	Children with disabilities	Inclusive support systems	Educational inclusion	**Contextual:** Identifies systemic accessibility and implementation barriers

Note. The table summarizes the 27 studies retained for focused synthesis from the Scopus dataset. Relevance labels indicate alignment with the review scope and should not be interpreted as quality scores.

4.3 Educational Contexts

The 27 selected studies were classified according to their primary educational context. Higher education represented the largest category (n = 8; 29.6%), followed by special education (n = 6; 22.2%) and mixed or unspecified educational settings (n = 6; 22.2%). Primary education accounted for four studies (14.8%), while secondary education was represented by three studies (11.1%).

Table 4. Educational Contexts Represented in the 27-Study Synthesis

Educational context	No. of studies	Percentage
Higher education	8	29.6%
Special education	6	22.2%

Educational context	No. of studies	Percentage
Mixed/unspecified	6	22.2%
Primary education	4	14.8%
Secondary education	3	11.1%
Total	**27**	**100.0%**

The distribution indicates a comparatively stronger research emphasis on higher education and special education, which together accounted for 51.8% of the selected studies. In contrast, primary and secondary education were less frequently represented. This imbalance suggests a need for further empirical investigation of AI-enabled and assistive technologies within school-level inclusive education, particularly across primary and secondary settings.

4.4 Disability Groups

The selected studies addressed a heterogeneous range of disability groups. For analytical purposes, populations were classified as specific learning disabilities, autism spectrum disorder (ASD), intellectual disability, visual impairment, hearing impairment, physical disability, communication disorders, multiple disabilities, and mixed/general disability populations. Studies addressing several disability categories without a dominant group were classified as mixed/general.

Table 5. Disability Groups and Illustrative Technology/Support Focus in the Selected Studies

Disability group	Representation	Illustrative technology/support focus
Specific learning disabilities	Represented	Adaptive learning, reading/writing support, multisensory technologies
Autism spectrum disorder	Represented	Adaptive instruction, communication and personalized learning
Intellectual disability	Represented	AI-enabled learning, accessibility and educational support
Visual impairment	Represented	Accessible learning technologies, screen-reading and information access
Hearing impairment	Limited	Captioning, communication and accessibility technologies
Physical disability	Represented	Assistive technologies, accessible interfaces and participation support
Communication disorders	Limited	AAC, speech technologies and AI-supported communication
Multiple disabilities	Represented	Adaptive and individualized assistive support
Mixed/general disabilities	Strongly represented	AI, AT, digital accessibility and inclusive learning systems

Note. Disability categories are descriptive and may overlap across studies. Representation labels reflect the focused synthesis rather than population prevalence.

Overall, the evidence concentrated more strongly on **mixed disability populations, intellectual disabilities, physical disabilities, and broader special educational needs**, while several studies considered disability inclusively without differentiating outcomes by diagnostic category. Specific evidence relating to **hearing impairment and communication disorders was comparatively limited**.

This distribution indicates an important evidence gap. Although emerging AI and assistive technologies are increasingly presented as tools for disability-inclusive education, their effectiveness has not been investigated equally across disability populations. In particular, the relatively limited representation of learners with **hearing and communication-related disabilities** restricts conclusions regarding the inclusiveness and generalizability of current technological interventions. Future research should therefore evaluate AI-enabled and assistive technologies across a wider range of disability groups and report disability-specific outcomes rather than treating students with disabilities as a homogeneous population.

4.5 Types of Technologies

The technologies identified across the selected studies were classified according to their primary functionality and level of AI integration. Three overlapping categories emerged: **AI-enabled technologies, conventional assistive technologies, and AI-enabled assistive technologies**. This classification recognizes the increasing convergence between artificial intelligence and established accessibility tools.

Table 6. Taxonomy of Technologies in Disability-Inclusive Education

Table 6. Taxonomy of AI-Enabled, Conventional, and AI-Enabled Assistive Technologies

Category	Technology	Primary educational/support function
AI-enabled technologies	Generative AI	Personalized explanations, content generation and learning support
	Chatbots/conversational AI	Interactive assistance, guidance and communication
	Adaptive learning	Personalized content, pace and learning pathways
	Intelligent tutoring systems	Individualized instruction, scaffolding and feedback
	Natural language processing (NLP)	Text processing, simplification and language support
	Speech recognition	Voice-based interaction, transcription and alternative input
	Computer vision	Visual recognition and interpretation of educational/environmental information
	Predictive systems	Identification of learning patterns and support needs
Assistive technologies	Text-to-speech	Reading and auditory access
	Speech-to-text	Writing and alternative input
	Screen readers	Digital access for learners with visual impairments
	AAC systems	Communication support
	Reading/writing applications	Literacy and task-completion support
	Accessible interfaces	Alternative access to digital learning environments
	Mobile assistive applications	Portable accessibility and learning support
AI-enabled assistive technologies	AI-enhanced AAC	Predictive and personalized communication
	Intelligent speech/text tools	Adaptive reading, writing and communication support
	AI-based accessibility applications	Personalized and context-sensitive accessibility
	AI-enhanced adaptive interfaces	Interfaces responsive to individual accessibility needs

Note. Categories are analytically overlapping because some systems combine conventional assistive functions with AI capabilities.

The evidence indicates a transition from **predominantly predefined assistive functions toward more adaptive, personalized, and context-responsive forms of support**. Conventional AT primarily addresses specific accessibility requirements, whereas AI-enabled systems can potentially adapt content, interaction, feedback, and communication according to learner characteristics and patterns of use.

Importantly, these categories are not mutually exclusive. Technologies such as AI-enhanced AAC, intelligent speech-to-text systems, and adaptive accessibility applications combine conventional assistive functions with AI capabilities. The findings therefore suggest increasing convergence between **AI and AT**, rather than the replacement of established assistive technologies by AI-based systems.

4.6 Purposes of Technology Use

The technologies identified in the selected studies served multiple educational and accessibility functions. Their purposes were classified into nine categories: **reading, writing, communication, numeracy, assessment, accessibility, personalized learning, classroom participation, and independent learning**. Because individual technologies frequently supported more than one function, these categories were treated as overlapping rather than mutually exclusive.

Table 7. Educational and Accessibility Purposes of AI and Assistive Technologies

Purpose	Typical technological applications	Intended support
Reading	Text-to-speech, screen readers, NLP, text simplification	Improve access to and comprehension of written content
Writing	Speech-to-text, word prediction, generative AI	Support text production, spelling and written expression
Communication	AAC, conversational AI, speech technologies	Facilitate interaction and alternative communication
Numeracy	Adaptive learning and intelligent tutoring	Support mathematical understanding and individualized practice
Assessment	AI-supported/adaptive assessment and analytics	Provide formative feedback and identify learning needs
Accessibility	Screen readers, accessible interfaces, mobile AT	Reduce sensory, physical and digital access barriers
Personalized learning	Generative AI, adaptive learning, intelligent tutoring	Adapt content, pace, feedback and learning pathways
Classroom participation	AAC, accessible applications, digital support tools	Facilitate engagement and participation in learning activities
Independent learning	AI assistants, mobile AT, adaptive applications	Increase learner autonomy and reduce reliance on continuous assistance

Note. Technology purposes are non-mutually exclusive; a single application may support multiple educational or accessibility functions.

Across the reviewed literature, **accessibility, personalized learning, communication, and classroom participation** emerged as particularly important purposes of technology use. AI-enabled technologies were primarily associated with personalization, adaptive support, feedback, and interactive assistance, whereas conventional assistive technologies were more commonly directed toward accessibility, communication, reading, and writing.

The findings further indicate that these functions are interconnected. Improved accessibility can facilitate classroom participation, while personalized support can strengthen independent learning. Technology use in disability-inclusive education should therefore be understood as a **multifunctional support system rather than a set of isolated technological interventions**.

4.7 Reported Outcomes

The reviewed studies reported a range of educational and inclusion-related outcomes associated with AI and assistive technologies. These outcomes were grouped into eight broad categories: **academic**

achievement, engagement, participation, accessibility, independence, communication, motivation, and self-efficacy.

Table 8. Reported Educational and Inclusion-Related Outcomes of Technology Use

Outcome	Typical reported contribution
Academic achievement	Improved task performance, comprehension, skill development, and learning progress
Engagement	Greater interaction with learning materials and sustained involvement in educational activities
Participation	Increased involvement in classroom, collaborative, and institutional learning activities
Accessibility	Reduced sensory, physical, communication, and digital barriers
Independence	Greater ability to complete learning tasks with reduced continuous assistance
Communication	Improved expressive and receptive communication through AAC, speech, and language technologies
Motivation	Increased willingness to participate and persist in learning activities
Self-efficacy	Greater confidence in completing academic and technology-supported tasks

Note. Outcomes summarize reported contributions across heterogeneous study designs and do not imply pooled causal effects.

Overall, the evidence suggests that the strongest and most consistently reported benefits relate to **accessibility, participation, personalized support, and learner independence**. Improvements in academic achievement were also reported, although these findings were more dependent on the type of intervention, learner population, and study design. Outcomes such as motivation and self-efficacy were reported less consistently and were often examined indirectly through learner or teacher perceptions.

The findings indicate that the value of AI and assistive technologies extends beyond academic performance. Their contribution to disability-inclusive education is also reflected in improved access, communication, autonomy, and participation, which are central dimensions of meaningful educational inclusion.

4.8 Barriers and Challenges

Despite their potential benefits, the implementation of AI and assistive technologies was constrained by a range of technological, institutional, pedagogical, and ethical barriers. The major challenges identified across the literature are summarized below.

Table 9. Reported Barriers and Implementation Challenges

Barrier	Description
Cost	High acquisition, maintenance, licensing, and upgrading costs
Infrastructure	Inadequate devices, connectivity, technical support, and digital infrastructure
Digital divide	Unequal access to technology across socioeconomic and geographical contexts
Teacher competency	Limited capacity to select, integrate, and evaluate appropriate technologies
Training	Insufficient professional development for educators and support staff
Accessibility problems	Inaccessible interfaces, incompatibility with assistive devices, and poor inclusive design
Algorithmic bias	Risk of inaccurate or discriminatory outputs for underrepresented disability groups

Barrier	Description
Privacy	Concerns regarding collection and use of sensitive learner information
Data protection	Uncertainty regarding storage, sharing, and governance of personal and disability-related data
Reliability	Inconsistent performance, inaccurate AI outputs, and dependence on automated systems
AI literacy	Limited understanding of AI capabilities, limitations, and responsible use
Institutional readiness	Weak policies, limited leadership support, inadequate resources, and insufficient implementation planning

Note. Barriers were synthesized thematically across technological, pedagogical, institutional, and ethical domains.

The barriers reveal that successful implementation depends on more than technological availability. **Teacher capacity, institutional readiness, infrastructure, accessibility, and governance** emerged as critical conditions shaping whether AI and assistive technologies can be used effectively and equitably.

Ethical concerns were particularly relevant to AI-enabled systems. Issues relating to **algorithmic bias, privacy, data protection, transparency, reliability, and human oversight** may be especially consequential when technologies are used with students with disabilities. These findings reinforce the need for accessibility-by-design, disability-sensitive AI governance, sustained professional development, and institutional strategies that prioritize equity alongside technological innovation.

5. Discussion

5.1 Principal Findings

This systematic review examined the emerging intersection of **artificial intelligence (AI), assistive technology (AT), disability, and inclusive education**. The findings indicate that digital technologies are increasingly moving beyond conventional accessibility functions toward adaptive and personalized forms of educational support, while established assistive technologies remain fundamental to participation and inclusion (Fernández-Batanero et al., 2022; WHO & UNICEF, 2022).

Regarding **RQ1**, the reviewed evidence demonstrates considerable technological diversity. Conventional technologiesincluding screen readers, augmentative and alternative communication (AAC), text-to-speech, speech-to-text, and accessible interfacescontinue to provide essential accessibility support. At the same time, adaptive learning, natural language processing, conversational AI, intelligent tutoring, predictive systems, and generative AI are expanding the range of support available to learners with disabilities. This development is consistent with recent evidence showing increasing interest in generative AI applications within special education (Wang et al., 2025).

Regarding RQ2, AI and assistive technologies serve multiple and overlapping purposes, particularly accessibility, communication, personalized learning, classroom participation, reading and writing support, and independent learning. Reported outcomes extend beyond academic achievement to include improved access, engagement, participation, communication, and autonomy. This multidimensional interpretation consists of the broader understanding of assistive technology as a means of enhancing functioning, independence, participation, and inclusion rather than merely improving academic performance (WHO & UNICEF, 2022).

Regarding RQ3, technological potential is constrained by persistent implementation challenges, including cost, inadequate infrastructure, unequal digital access, insufficient teacher preparation, accessibility limitations, and institutional readiness. AI-enabled technologies introduce additional concerns regarding privacy, data protection, algorithmic bias, reliability, transparency, and human oversight. Miao et al. (2021) similarly emphasize that realizing the educational potential of AI requires policies that balance innovation with inclusion, equity, and appropriate management of associated risks.

Collectively, the findings indicate that technological sophistication alone cannot ensure educational inclusion. Effective implementation depends on the interaction between learner needs, accessible technology, pedagogical practice, teacher capacity, institutional support, infrastructure, and responsible governance. The evidence therefore supports viewing technology as an enabling component of inclusive education rather than an educational outcome.

5.2 Transformation from Assistive to Intelligent Support

A central conceptual insight emerging from this review is the potential transformation of educational assistive technology from predominantly predefined support toward increasingly adaptive, predictive, and generative forms of assistance. This development can be conceptualized as:

Static Assistance → Adaptive Assistance → Predictive Assistance → Generative/Personalized Assistance

Static assistance encompasses established AT functions designed to address specific accessibility barriers, including screen reading, magnification, alternative input, captioning, AAC, and text-to-speech. Such technologies remain fundamental because assistive products can facilitate functioning, independence, participation, and access to education (WHO & UNICEF, 2022; Fernández-Batanero et al., 2022).

Adaptive assistance represents a shift toward systems capable of modifying content, difficulty, pace, interface, or feedback according to learner characteristics and performance. This moves technological support beyond standardized accommodation toward greater responsiveness to individual learning requirements. AI in education has increasingly been associated with opportunities for personalized learning and adaptive educational support, although these opportunities require careful consideration of inclusion and equity (Miao et al., 2021).

Predictive assistance extends this functionality through the analysis of learner data and interaction patterns to anticipate difficulties, identify support requirements, or inform educational interventions. Although predictive capabilities may facilitate more targeted support, they also increase concerns surrounding data quality, privacy, transparency, bias, and the appropriateness of algorithmically informed educational decisions (Miao et al., 2021).

Generative and personalized assistance represents the most recent stage of this trajectory. Generative AI can dynamically produce explanations, restructure or simplify content, support writing and communication, generate individualized learning materials, and provide conversational assistance. Recent systematic evidence indicates growing application of generative AI within special education while simultaneously identifying unresolved questions concerning its effects and challenges for learners with disabilities (Wang et al., 2025).

This progression should not be interpreted as a linear replacement of conventional assistive technologies. Rather, it reflects increasing **technological convergence**, whereby established assistive functions are combined with adaptive, predictive, and generative capabilities. Conventional AT remains essential, particularly because access to appropriate assistive products continues to be highly unequal globally (WHO & UNICEF, 2022).

The theoretical significance of this transformation lies in the changing function of technology within inclusive education: from primarily reducing or compensating for accessibility barriers toward potentially adapting learning environments, anticipating support needs, and generating individualized assistance. However, intelligent support should augment rather than displace teacher judgement, learner agency, and human interaction. Its contribution to meaningful inclusion ultimately depends on accessible design, institutional capacity, AI literacy, ethical governance, and sustained human oversight (Miao et al., 2021; Wang et al., 2025).

5.3 Disability Representation Gap

The findings indicate that disability populations are unevenly represented within the emerging literature on AI and assistive technologies. Research has given comparatively greater attention to mixed disability populations, intellectual disabilities, physical disabilities, and broader special educational needs, while evidence concerning learners with hearing impairments and communication disorders remains comparatively limited. This imbalance is important because technological effectiveness cannot be assumed to generalize across disability groups with substantially different sensory, cognitive, physical, and communication requirements.

A further limitation is the frequent treatment of students with disabilities as a homogeneous population. Such aggregation can obscure disability-specific accessibility requirements and differential responses to technological interventions. Although assistive technologies can enhance functioning, independence, and participation, their effectiveness depends on alignment with individual needs and contexts (WHO & UNICEF, 2022; Fernández-Batanero et al., 2022). Future research should therefore include underrepresented disability populations and report disaggregated outcomes wherever possible.

5.4 Educational Context Gap

The evidence also reveals an uneven distribution across educational contexts. In the preliminary synthesis, higher education constituted the largest category (29.6%), followed by special education (22.2%), whereas primary (14.8%) and secondary education (11.1%) were less frequently represented. This pattern suggests that evidence concerning AI and assistive technologies is developing more rapidly in universities and specialized educational environments than across mainstream school settings.

This imbalance has implications for generalizability. Universities typically differ from schools in technological infrastructure, learner autonomy, institutional support, and patterns of technology use. Similarly, evidence generated in special education settings may not transfer directly to mainstream inclusive classrooms. More research is therefore required in primary and secondary inclusive classrooms, where technology must operate alongside teacher-led instruction, peer interaction, curriculum requirements, and diverse learner needs.

5.5 Geographical Inequality and the Digital Inclusion Paradox

The literature demonstrates increasing international interest in technology-supported inclusion, with contributions from both developed and emerging economies. Nevertheless, the capacity to implement AI and assistive technologies remains strongly influenced by differences in infrastructure, affordability, connectivity, professional expertise, and institutional resources. Global access to assistive technology remains highly unequal, particularly in low- and middle-income countries (WHO & UNICEF, 2022).

This inequality creates a potential **digital inclusion paradox**: learners and educational systems that may benefit substantially from scalable assistive and AI-enabled support can simultaneously face the greatest barriers to accessing and sustaining such technologies. Limited connectivity, device availability, technical support, locally appropriate tools, and teacher training may therefore widen rather than reduce educational inequalities if technological innovation is introduced without paying attention to implementation conditions.

The geographical expansion of AI-enabled inclusive education should consequently be accompanied by greater research from the **Global South and resource-constrained educational systems**. Importantly, such research should move beyond transferring technologies developed in high-resource contexts and examine locally appropriate, affordable, linguistically accessible, and sustainable approaches to disability-inclusive technology.

5.6 Teacher and Institutional Readiness

A consistent implication of the reviewed evidence is that **technology availability does not equate to meaningful educational inclusion**. Providing schools or universities with assistive devices or AI-enabled platforms may increase technological access, but inclusive outcomes depend on whether these technologies can be appropriately selected, integrated, supported, and evaluated within educational practice.

This relationship can be expressed as:

Technology availability ≠ Meaningful educational inclusion

unless supported by:

Teacher competence + Accessible design + Institutional infrastructure + AI literacy + Ethical governance

Teacher competence is particularly important because educators mediate the relationship between technological capability and pedagogical application. Teachers require not only technical skills but also the ability to determine when technology is appropriate, adapt its use to individual learners, evaluate AI-generated information, and integrate technological support without reducing learner agency. Emerging AI applications therefore create a parallel need for **AI literacy**, including awareness of limitations, bias, privacy, reliability, and appropriate human oversight (Miao et al., 2021).

Institutional readiness is equally important. Effective implementation requires accessible digital infrastructure, technical support, professional development, procurement policies, data protection, and mechanisms for evaluating accessibility and educational effectiveness. These conditions reinforce the central analytical argument of this review: technology functions as an **enabler of inclusion rather than inclusion itself**. Meaningful outcomes emerge only when technological capabilities are aligned with learner needs, inclusive pedagogy, institutional capacity, and responsible governance.

5.7 Ethical and Governance Issues

The increasing use of AI in disability-inclusive education introduces ethical and governance concerns that extend beyond those associated with conventional assistive technologies. **Privacy and student data protection** are particularly important because AI-enabled systems may process sensitive information concerning disability status, learning behaviour, communication patterns, and academic performance. Responsible implementation therefore requires clear policies concerning data collection, storage, access, consent, and secondary use (Miao et al., 2021).

Algorithmic bias and explainability present additional concerns. AI systems trained on datasets that inadequately represent learners with disabilities may generate inaccurate recommendations or reproduce existing educational inequalities. Limited transparency can further make it difficult for teachers and learners to understand how automated recommendations or decisions are produced. These risks are particularly consequential when AI is used for assessment, learner profiling, or decisions concerning educational support.

Excessive dependence on AI may also reduce learner agency or encourage inappropriate substitution of automated systems for professional judgement. Human oversight should therefore remain central to AI-supported educational decisions, particularly were outputs influence assessment, intervention, or access to support. Generative AI should augment rather than replace relationships among learners, teachers, families, and disability-support professionals (Wang et al., 2025).

Finally, **accessibility-by-design and equity** should be treated as core governance principles rather than post-development adjustments. AI-enabled educational systems should accommodate diverse sensory, physical, cognitive, linguistic, and communication requirements from the design stage. Without such safeguards, AI may reproduce the same barriers it is intended to address. Responsible disability-inclusive AI therefore requires an integrated approach combining **accessibility, privacy, fairness, transparency, human oversight, and equitable access** (WHO & UNICEF, 2022).

6. Proposed AI-Enabled Inclusive Education Framework

Based on the synthesis, this review proposes an **AI-Enabled Inclusive Education Framework** that explains how learner needs, technological capabilities, support functions, and educational outcomes interact within disability-inclusive education. The framework consists of four interconnected layers.

Layer 1 — Learner Needs

Disability characteristics and individual learner needs determine specific **accessibility and educational support requirements**.

Layer 2 — Technology

These requirements may be addressed through **conventional assistive technologies, AI-enabled assistive technologies, and generative/adaptive AI systems**. Rather than representing mutually exclusive categories, these technologies form an increasingly interconnected support ecosystem.

Layer 3 — Support Functions

Technology contributes to inclusion through six principal functions: **accessibility, personalization, communication, learning support, assessment, and participation**.

Layer 4 — Educational Outcomes

Effective support may contribute to **academic achievement, engagement, independence, participation, equity, and inclusion**.

The relationship between these layers is influenced by contextual conditions, particularly **teacher readiness, institutional support, infrastructure, AI literacy, ethics, and governance**. These factors can facilitate or constrain the translation of technological capability into meaningful educational outcomes.

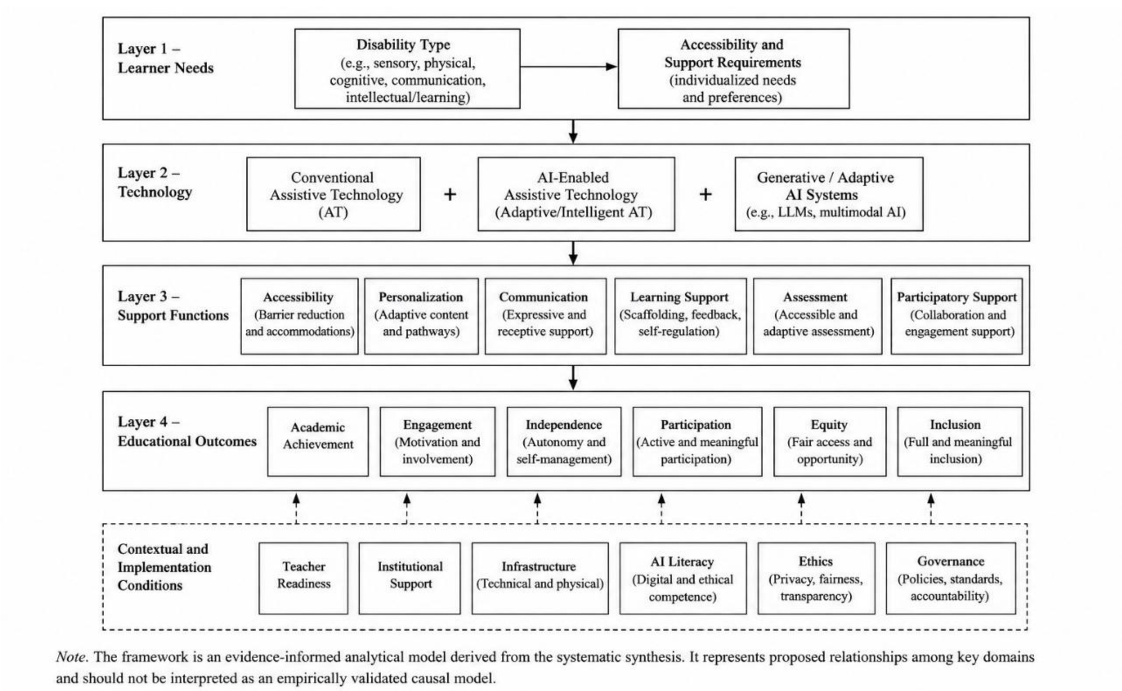

Figure 2. Proposed AI-Enabled Inclusive Education Framework

Note. The framework is an evidence-informed analytical model derived from the systematic synthesis. It represents proposed relationships among key domains and should not be interpreted as an empirically validated causal model.

7. Research Agenda

The synthesis identifies several priorities for advancing research on AI and assistive technologies in disability-inclusive education. Rather than focusing primarily on technological innovation, future research should examine whether these technologies produce **sustained, equitable, and contextually meaningful educational outcomes**.

Table 10. Evidence Gaps and Priorities for Future Research

Domain	Evidence gap	Research priority
Technology	Limited evidence on sustained effectiveness of emerging AI	Conduct longitudinal evaluations of generative, adaptive, and AI-enabled assistive technologies
Learners	Uneven representation of disability groups	Include diverse disability populations and report disability-specific outcomes

Domain	Evidence gap	Research priority
Teachers	Limited evidence on educator preparedness	Examine AI literacy, AT competence, and inclusive digital pedagogy
Institutions	Insufficient attention to implementation capacity	Evaluate institutional readiness, infrastructure, technical support, and sustainability
Ethics	Emerging concerns regarding privacy, bias, and transparency	Develop and evaluate disability-sensitive AI governance frameworks
Geography	Unequal geographical distribution of evidence	Expand context-sensitive research in developing economies and the Global South
Methodology	Strong reliance on descriptive and perception-based evidence	Increase experiments, quasi-experiments, longitudinal studies, mixed methods designs, and real-world interventions

Note. Priorities are derived from the evidence gaps identified in the focused synthesis.

A particularly important methodological priority is the transition from studies examining **acceptance, perceptions, and intended use** toward research demonstrating whether technologies improve accessibility, participation, independence, and learning over time. Future studies should also examine for whom technologies work, under what conditions, and whether benefits are sustained across educational contexts.

8. Implications

8.1 Theoretical Implications

The findings extend conventional perspectives on assistive technology by demonstrating a transition from predominantly predefined accessibility support toward adaptive, predictive, and generative assistance. AI does not replace traditional AT; rather, it expands its potential through personalization, contextual responsiveness, prediction, and dynamic content generation. The proposed framework therefore conceptualizes inclusive educational technology as an interaction among learner needs, technological capabilities, support mechanisms, educational practices, and contextual conditions, rather than as a direct relationship between technology use and educational outcomes.

8.2 Practical Implications

For teachers and disability-support professionals, technology selection should begin with learner needs and accessibility requirements rather than technological novelty. Educators require competencies to evaluate AI outputs, integrate AT into instruction, personalize support, protect learner autonomy, and identify situations requiring human intervention. Educational technologists should prioritize interoperability, usability, accessibility-by-design, and compatibility with established assistive systems.

8.3 Institutional Implications

Schools and universities should approach AI and AT implementation as an **institutional capacity issue**, not merely a technology procurement decision. Effective adoption requires accessible infrastructure, technical support, staff development, sustainable funding, procurement standards, and mechanisms for evaluating educational effectiveness. Institutions should additionally involve students with disabilities and disability-support professionals in technology selection, implementation, and evaluation.

8.4 Policy Implications

Educational policies should explicitly incorporate **disability inclusion into AI governance and digital transformation strategies**. Policy frameworks should address accessibility standards, privacy, sensitive student data, algorithmic fairness, transparency, human oversight, and equitable access. Attention is required to prevent AI-driven educational innovation from widening existing inequalities between institutions, socioeconomic groups, and geographical regions. Disability-inclusive AI policy should therefore combine technological innovation with accessibility, rights, equity, and responsible governance (Miao et al., 2021; WHO & UNICEF, 2022).

9. Limitations

Several limitations should be considered when interpreting the findings. First, reliance on Scopus may have excluded relevant studies indexed exclusively in other databases such as Web of Science or ERIC. Second, restricting inclusion to English-language publications may have introduced language bias and reduced representation of research from non-English-speaking contexts. Third, publication bias may have resulted in greater visibility of studies reporting positive technological outcomes.

The substantial **heterogeneity of disability categories, educational settings, technologies, study designs, and outcome measures** also limits direct comparison across studies. In addition, the rapid development of generative and adaptive AI means that the evidence base is evolving quickly, and some technologies may have changed substantially between publication and review. Finally, variation in outcome definitions and measurement approaches limits the extent to which conclusions regarding educational effectiveness can be generalized across disability groups and contexts.

10. Conclusion

This systematic review demonstrates that AI and assistive technologies are expanding opportunities for accessible, personalized, and participatory education for students with disabilities. Established assistive technologies remain essential, while adaptive, predictive, conversational, and generative AI are extending technological support toward increasingly individualized forms of assistance.

However, important evidence gaps remain. Research is unevenly distributed across disability populations, educational levels, technologies, geographical regions, and methodological approaches. Evidence concerning long-term effectiveness, underrepresented disability groups, school-level implementation, teacher readiness, institutional capacity, and ethical governance remain particularly limited.

The future of disability-inclusive educational technology should therefore not be defined by AI adoption alone. Progress requires the alignment of technological capability with learner needs, accessible design, inclusive pedagogy, institutional readiness, AI literacy, equitable access, and responsible governance. In this context, the transition from conventional assistive technology toward intelligent support should be evaluated not by technological sophistication, but by its capacity to improve accessibility, autonomy, participation, learning, equity, and meaningful inclusion.

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