

Artificial Intelligence in Inclusive and Special Education: A Narrative Survey

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ABSTRACT:

Background: Artificial intelligence (AI) is increasingly discussed as a means of supporting inclusive and special education through adaptive learning, assistive technologies, learning analytics, automated feedback, and generative AI. However, the educational value of AI for learners with disabilities depends on accessibility, pedagogical alignment, data protection, teacher agency, and equitable implementation. Objectives: This narrative survey synthesizes current literature and policy guidance on AI in inclusive and special education, with emphasis on applications, opportunities, risks, and responsible implementation. Methods: The paper uses a structured narrative review approach based on peer-reviewed review articles, foundational AI-in-education literature, and international policy sources relevant to inclusive education, assistive technology, and AI governance. Results: The synthesis indicates that AI may support personalization, accessibility, communication, teacher workload reduction, early identification of support needs, and formative feedback. At the same time, evidence remains uneven across disability groups, educational levels, and low-resource contexts. Major risks include inaccurate outputs, bias, privacy concerns, limited transparency, over-reliance, insufficient teacher preparation, and inequitable access. Conclusion: AI should be positioned as a human-supervised support system rather than a substitute for teachers, special educators, therapists, or institutional responsibility. Responsible adoption requires Universal Design for Learning, learner and family participation, rigorous evaluation, transparent policies, and safeguards for privacy, fairness, and academic integrity.

Keywords: Artificial Intelligence, Inclusive Education, Special Education, Assistive Technology, Generative AI

1. Introduction

Inclusive and special education seek to ensure that learners with disabilities and diverse learning needs can access meaningful, equitable, and high-quality educational opportunities. International rights-based frameworks emphasize access to education

without discrimination and the provision of reasonable accommodation (UN Committee on the Rights of Persons with Disabilities, 2016; UNESCO, 2020; United Nations, 2006). In this context, artificial intelligence has become a highly visible educational technology because it can

analyze learner data, generate content, adapt learning materials, support communication, and provide automated feedback.

AI in education is not a single intervention. It includes intelligent tutoring systems, adaptive learning platforms, educational data mining, learning analytics, automated assessment, recommender systems, speech and language technologies, computer vision applications, and generative AI (Holmes et al., 2019; Roll & Wylie, 2016; Zawacki-Richter et al., 2019). In inclusive and special education, these tools may support learners with autism spectrum disorder, learning disabilities, sensory impairments, communication disabilities, attention-related difficulties, physical disabilities, and multiple disabilities. AI may also help teachers differentiate instruction, monitor progress, and create accessible materials.

The promise of AI must be interpreted carefully. The existence of an AI tool does not guarantee educational benefit. Learners with disabilities may be disproportionately affected by poorly designed systems, inaccessible interfaces, biased datasets, inappropriate automated decisions, or surveillance-based technologies. Inaccurate generative outputs are particularly concerning because students may rely on fluent but unsupported responses (Kasneji et al., 2023). For special education, where educational decisions may affect placement, support services, individualized planning, and long-term opportunity, AI must be implemented with strong human oversight.

This paper surveys the role of AI in inclusive and special education. The objectives are: (a) to map major AI application areas relevant to inclusive education; (b) to synthesize potential benefits and risks; (c) to discuss ethical and governance considerations; and (d) to propose future research and implementation directions. The paper is intentionally conservative. It does not claim that AI improves outcomes universally. Instead, it argues that AI can be useful when it is accessible, pedagogically justified, transparent, evidence-informed, and embedded within inclusive educational practice.

2. Methodology

This paper uses a structured narrative survey design. A narrative survey is appropriate when the aim is to synthesize concepts, application domains, opportunities, and challenges across an interdisciplinary field rather than to calculate pooled effect sizes. The paper does not present itself as a PRISMA systematic review or meta-analysis. Therefore, no claim is made that all available studies were exhaustively retrieved, screened, and coded.

The source base consisted of four categories: peer-reviewed reviews and foundational studies in AI in education; literature on learning analytics, intelligent tutoring systems, and educational data mining; sources related to inclusive education and assistive technology; and policy or governance documents addressing generative AI, data protection, fairness, and high-risk educational AI. Preference was given to peer-reviewed journal articles, books from academic publishers, and documents from international organizations or official regulatory bodies.

Because this is a review paper, there were no human participants, experimental intervention, recruitment procedure, or primary data collection. The analytical procedure consisted of thematic synthesis. Sources were read for recurring application areas, educational affordances, risks, ethical requirements, and implementation considerations. Findings were organized into categories that are meaningful for special and inclusive education: personalization and adaptive learning, assistive and accessible technologies, teacher support, assessment, feedback, and learning analytics, generative AI in inclusive education, and ethical and governance considerations.

The review has two important limitations. First, the paper synthesizes available literature rather than performing an exhaustive database search. Second, AI tools and generative AI systems are developing rapidly; therefore, claims about specific tools may become outdated. To reduce this risk, the paper emphasizes stable principles such as

accessibility, human oversight, fairness, privacy, transparency, and pedagogical alignment rather than claims about individual commercial products.

Table 1. Major AI Application Areas in Inclusive and Special Education

AI application area	Typical educational use	Potential inclusive-education contribution	Main caution
Intelligent tutoring systems	Step-by-step hints, practice, feedback, learner modelling	May provide individualized practice and immediate support for learners who need repeated explanation	Requires domain validity and should not replace teacher diagnosis
Adaptive learning platforms	Adjusting content sequence, difficulty, or modality	Can support differentiated instruction and pacing	Personalization may be narrow and data-driven paths may hide curriculum decisions
Learning analytics	Monitoring engagement, progress, and risk indicators	May help identify learners needing support earlier	Prediction must not become labelling or automated exclusion
Speech, language, and text technologies	Captioning, text-to-speech, speech-to-text, translation, AAC support	Can improve communication and access for sensory, language, or communication needs	Accuracy varies by language, accent, disability profile, and environment
Automated feedback and assessment	Formative comments, quiz feedback, rubric-based assistance	May increase feedback frequency and support revision	High-stakes assessment requires human oversight and validation
Generative AI	Drafting explanations, examples, accessible texts, quizzes, summaries	Can help teachers create differentiated resources and support learner questioning	May hallucinate, reproduce bias, or encourage over-reliance

3. Results

The narrative synthesis produced six major themes: personalization and adaptive learning; assistive and accessible technologies; teacher support; assessment, feedback, and learning analytics; generative AI in inclusive education; and ethical and governance considerations. These themes are presented as results of the review synthesis, not as primary empirical findings. Table

1 summarizes the major AI application areas associated with these themes, together with their potential inclusive-education contributions and main cautions.

3.1 Personalization and Adaptive Learning

Personalization is one of the most frequently cited benefits of AI in education (Holmes et al., 2019).

In inclusive settings, personalization may involve different representations of content, flexible pacing, adaptive hints, simplified language, alternative examples, additional practice, or multimodal presentation. For students with disabilities, such flexibility can reduce barriers when the tool is aligned with individualized educational goals and when teachers remain involved in interpreting learner progress (VanLehn, 2011; Woolf, 2009).

However, personalization should not be reduced to algorithmic sequencing of content. Inclusive education is relational and contextual. Students may require emotional support, social participation, communication support, family collaboration, and professional judgment that cannot be supplied by an algorithm alone. Therefore, AI-supported personalization should be treated as a supplement to inclusive pedagogy rather than a substitute for it.

3.2 Assistive and Accessible Technologies

AI can strengthen assistive technologies through speech recognition, natural-language processing, computer vision, text simplification, captioning, image description, translation, and predictive communication support. These functions may assist learners with visual, hearing, communication, mobility, or language-related barriers (WHO & UNICEF, 2022). In addition, generative AI may help teachers transform materials into multiple reading levels, generate alternative examples, or draft accessible lesson supports.

The key issue is that accessibility cannot be assumed. An AI system may be technically advanced but inaccessible to learners using screen readers, augmentative and alternative communication devices, low-bandwidth connections, local languages, or non-standard input methods. AI tools used in special education should be tested with the intended learner population and should follow accessibility and Universal Design for Learning principles (CAST, 2024).

3.3 Teacher Support

Teachers and special educators may use AI to draft

individualized practice activities, generate formative questions, adapt reading passages, summarize learner responses, or prepare differentiated materials. These uses may reduce routine workload and support inclusive planning. AI may also help teachers generate alternative explanations or examples for students who require additional scaffolding.

Teacher agency remains essential. AI-generated material should be reviewed for factual accuracy, developmental appropriateness, cultural sensitivity, accessibility, and alignment with curriculum and individualized plans. Teachers also need professional development in AI literacy so that they can evaluate AI outputs rather than accepting them uncritically (Office of Educational Technology, 2023).

3.4 Assessment, Feedback, and Learning Analytics

AI-supported assessment and analytics can provide timely formative feedback and help teachers identify patterns in student progress (Baker & Inventado, 2014; Long & Siemens, 2011; Siemens & Baker, 2012). In inclusive education, such tools may be useful when they identify barriers early and prompt supportive interventions. For example, analytics may show that a learner is not accessing digital materials, repeatedly struggles with a concept, or benefits from a particular type of support.

At the same time, educational analytics can become harmful if used for surveillance, deficit labelling, or automated placement decisions. Data about disability, behaviour, performance, or accommodations are sensitive. Automated systems must therefore be transparent, contestable, and subject to professional review.

3.5 Generative AI in Inclusive Education

Generative AI is especially relevant because it can produce natural-language explanations, summaries, practice questions, feedback, and accessible alternatives quickly (Kasneci et al., 2023). It may support students by explaining concepts in simpler language, generating examples, or helping with brainstorming. It may support teachers by drafting differentiated materials and

administrative text.

The same flexibility creates risk. Generative AI systems can produce inaccurate, fabricated, or biased content. They can also create dependence if students use them to avoid thinking, writing, or problem solving. In special education, these risks require careful scaffolding. Responsible use should emphasize asking questions, comparing responses, checking sources, explaining reasoning, and documenting AI assistance where required (UNESCO, 2023).

3.6 Ethical and Governance Considerations

Across the reviewed literature and policy guidance, ethical and governance considerations recur as conditions for responsible adoption rather than optional additions. The requirements most frequently emphasized are human oversight, accessibility, data protection, fairness, transparency, and evaluation before large-scale

deployment. These concerns are amplified in special and inclusive education because AI-influenced decisions may affect access to services, support planning, and long-term opportunity, and because disability status and accommodation records are sensitive (European Parliament and Council of the European Union, 2024; UNESCO, 2023).

Table 2 consolidates these recurring requirements into evidence-informed principles for AI adoption, linking each principle to its meaning in practice and the reason it matters. The synthesis suggests that such principles are most effective when treated as design and procurement criteria from the outset rather than as compliance steps applied after a tool has already been deployed (CAST, 2024). These principles also provide the basis for the risk analysis and implementation guidance developed in the following section.

Table 2. Evidence-Informed Principles for AI Adoption in Inclusive Education

Principle	Meaning in practice	Reason for importance
Human oversight	Teachers, special educators, and institutions retain responsibility for decisions	Prevents automation from replacing professional judgment
Accessibility by design	Tools are tested with diverse learners, assistive devices, and language needs	Avoids excluding the learners AI is intended to support
Pedagogical alignment	AI is adopted only when linked to learning goals and inclusive practice	Reduces novelty-driven technology use
Data minimization	Only necessary learner data are collected and protected	Reduces privacy and security risk
Fairness review	Outputs and decisions are checked for bias across learner groups	Protects students from discriminatory effects
Transparency	Students, families, and teachers know how AI is used	Supports trust, consent, and accountability
Evaluation before scaling	Pilot evidence is reviewed before institutional adoption	Avoids large-scale deployment of untested tools

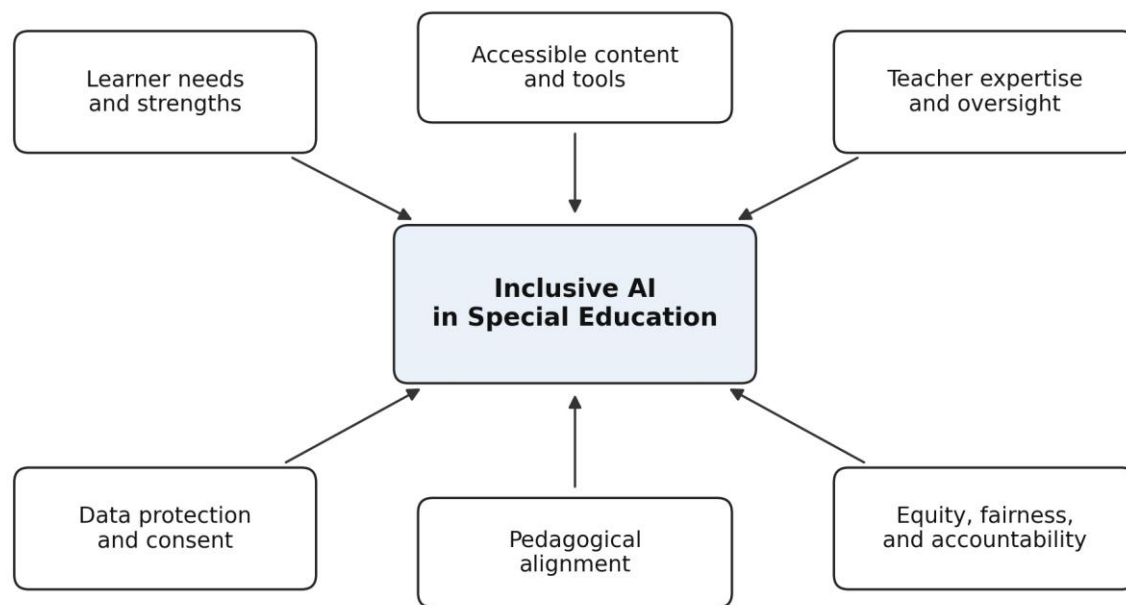


Figure 1. Conceptual framework for responsible AI use in inclusive and special education (author synthesis).

4. Discussion

The reviewed literature suggests that AI has practical potential in inclusive and special education, but only when embedded within human-centered educational systems. The strongest argument for AI is not that it can replace teachers, but that it can increase the availability of practice, feedback, representation, and access supports. For learners with disabilities, these supports may be meaningful when they reduce barriers and increase participation. Figure 1 summarizes the conceptual framework synthesized from this review, situating responsible AI use around learner needs, accessible content and tools, teacher expertise and oversight, pedagogical alignment, data protection, and equity.

The first implication is that AI should be evaluated through an inclusive lens. A tool that improves average performance may still be inappropriate if it disadvantages students with disabilities, fails to support assistive technologies, or increases surveillance. Inclusive evaluation should therefore consider access, participation, learner agency, dignity, privacy, and educational outcomes.

The second implication is that teacher preparation is central. AI literacy should be included in professional development for general educators, special educators, school leaders, and support

staff. Training should cover not only tool operation but also critical evaluation, prompt design, privacy, bias, accessibility, academic integrity, and the limits of automation.

The third implication concerns institutional governance. Schools and universities should not leave AI adoption to individual experimentation alone. Institutions need policies that define acceptable use, data responsibilities, procurement criteria, disclosure expectations, accessibility requirements, and procedures for review or appeal when AI affects educational decisions.

4.1 Implications for Students with Disabilities

For students with disabilities, AI can provide new forms of access and support. Examples include text-to-speech, speech-to-text, captioning, visual description, simplified language, personalized practice, and communication support. These applications are most defensible when they increase learner agency and participation rather than merely compensating for deficits.

However, students with disabilities should not be treated as passive recipients of AI systems. Their experiences, preferences, and feedback should inform design and implementation. Families, caregivers, special educators, therapists, and accessibility specialists may also need to be

involved depending on the learner's context and age (UN Committee on the Rights of Persons with Disabilities, 2016; United Nations, 2006).

4.2 Risks for Equity and Rights

Several risks are particularly important in special education. Algorithmic bias can occur when systems are trained on data that underrepresent learners with disabilities or misinterpret disability-related behaviours. Privacy risks are heightened because disability status and accommodation records are sensitive. Automated decision-making may affect access to services, supports, or educational pathways. Inaccurate AI-generated feedback may also be harmful if students or

teachers cannot easily detect errors.

These risks do not mean AI should never be used. They mean that AI in special education must be governed more carefully than low-stakes classroom tools. Systems that influence assessment, placement, monitoring, or access to educational opportunities require stronger accountability than tools used only for optional practice or teacher brainstorming (European Parliament and Council of the European Union, 2024). Table 3 summarizes the principal risks identified in this review, together with the consequences they may produce, and the safeguards recommended to address them.

Table 3. Risks and Safeguards for AI in Special and Inclusive Education

Risk	Possible consequence	Recommended safeguard
Hallucinated or inaccurate output	Students may learn incorrect information or receive misleading feedback	Teacher verification, source checking, and restricted use for high-stakes content
Bias in data or model outputs	Unfair recommendations, assessment, or support decisions	Bias testing, diverse validation, and appeal processes
Privacy leakage	Exposure of disability status, assessment data, or accommodations	Data minimization, consent, secure storage, and vendor review
Accessibility failure	Learners using assistive technologies may be excluded	Accessibility testing with intended users before adoption
Over-reliance	Reduced learner effort, reasoning, or independence	Use AI as scaffold, require explanation and reflection
Teacher deskilling	Professional judgment may be displaced by automated suggestions	Maintain teacher authority and professional development
Inequitable access	Benefits concentrate in well-resourced settings	Plan low-bandwidth, multilingual, and affordable alternatives

4.3 A Responsible Implementation Model

A responsible implementation model should begin with educational need rather than technology availability. Institutions should ask what barrier is being addressed, which learners are affected, what

evidence supports the tool, what risks exist, and how success will be evaluated. The model should include small-scale piloting, accessibility review, stakeholder feedback, and documentation before scaling (European Parliament and Council of the European Union, 2024; UNESCO, 2023). Table 4

translates these steps into a practical checklist that institutions can use to confirm a tool is justified, accessible, accountable, and evaluable before adoption.

Figure 2 presents an iterative governance cycle.

The cycle is intentionally circular because AI implementation should be continuously reviewed. A tool that is useful in one context may fail in another; a tool that is safe at one point may change after model updates; and learner needs may evolve over time.

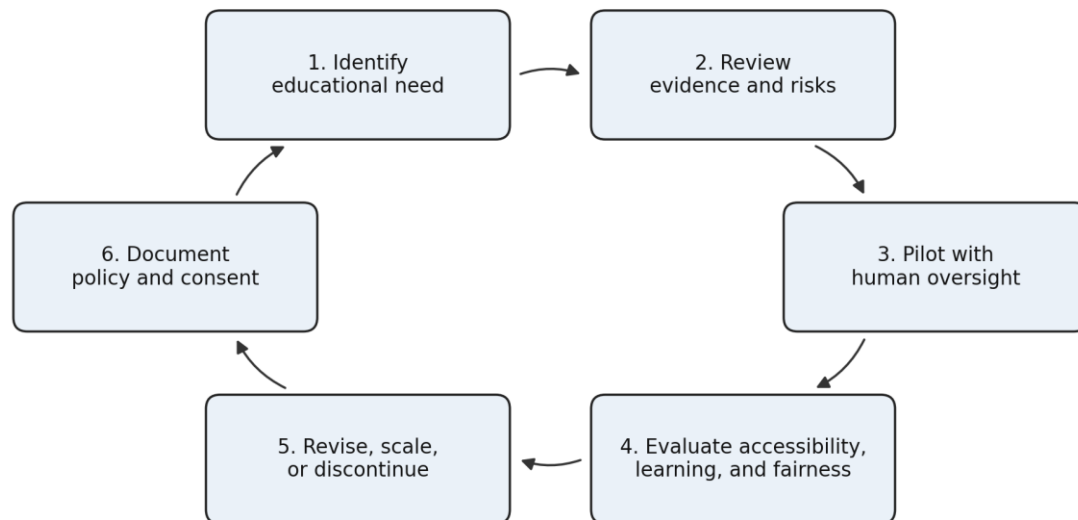


Figure 2. Iterative governance cycle for AI-supported inclusive education implementation (author synthesis).

Table 4. Practical Checklist Before Adopting AI in Inclusive Education

Question	Minimum acceptable answer before adoption
What educational barrier does the tool address?	A specific learner, teacher, accessibility, or assessment need is identified
Has the tool been tested with the intended learners?	Pilot feedback includes learners with disabilities and relevant support staff
Can teachers review or override outputs?	Human oversight is available and documented
What data are collected?	Only necessary data are collected, protected, and explained
Is the interface accessible?	Compatibility with assistive technologies and multiple modalities is checked
What happens when the tool is wrong?	There is a clear correction, appeal, or escalation process
How will impact be evaluated?	Learning, accessibility, fairness, and workload indicators are monitored

4.4 Limitations of the Review

The limitations of this paper are as follows.

It is a narrative survey rather than a systematic review. Therefore, it synthesizes selected literature and policy sources but does not provide exhaustive database coverage or pooled effect estimates. In addition, AI technologies evolve rapidly, especially generative AI systems, so product-specific claims may change. The paper therefore emphasizes stable, transferable principles rather than recommending specific commercial tools.

Another limitation is that the evidence base is uneven. Many studies of AI in education focus on general or higher education contexts (Crompton & Burke, 2023; Zawacki-Richter et al., 2019). Research directly involving students with disabilities, special educators, low-resource schools, and multilingual contexts remains comparatively limited. This gap should be addressed before strong claims are made about universal effectiveness.

5. Conclusion

AI has meaningful potential to support inclusive and special education through personalization, accessibility, assistive technologies, teacher support, analytics, and formative feedback. Generative AI adds further possibilities for differentiated content and conversational support. However, the educational value of AI depends on design, context, and governance. AI can also produce inaccurate outputs, reproduce bias, threaten privacy, increase surveillance, and widen inequities if adopted without safeguards.

The central conclusion of this survey is that AI should be used as a human-supervised support system. Teachers, special educators, learners, families, and institutions must remain central to educational decisions. Responsible AI in inclusive education requires Universal Design for Learning, accessibility testing, data protection, teacher professional development, transparent policies, and continuous evaluation. Future research should prioritize rigorous studies involving learners with disabilities, diverse educational contexts, long-term outcomes, learner agency, and equity-focused evaluation.

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