

Special Education and Inclusion: Tuned Algorithms – When the Future Learned to Listen to Those the Code Had Ignored

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ABSTRACT: The growing integration of Artificial Intelligence into education has expanded possibilities for accessibility, personalization, communication, and participation among students with disabilities while raising questions concerning algorithmic representation, bias, and educational responsibility. This study examined the relationship between Artificial Intelligence, special education, and inclusion, focusing on the conditions under which intelligent and assistive technologies can expand educational participation without reproducing existing forms of exclusion. A qualitative research design based on an integrative literature review was adopted, incorporating peer-reviewed studies and institutional documents addressing disability, assistive technologies, Universal Design for Learning, Artificial Intelligence, accessibility, teacher preparation, algorithmic bias, and ethical governance. The findings indicate that AI is not inherently inclusive; its educational value depends on accessible design, appropriate representation of disability, teacher mediation, institutional responsibility, and human oversight. The synthesis identified three interconnected levels of technological inclusion: access, adaptation, and recognition. While access enables technological participation and adaptation supports responsiveness to individual needs, recognition requires learner diversity to inform technological design, evaluation, and governance. It is concluded that inclusive AI requires more than increasingly sophisticated algorithms: it requires technological systems aligned with human variability, educational purpose, and the rights of persons with disabilities.

KEYWORDS: Special Education; Inclusive Education; Artificial Intelligence; Disability; Algorithmic Inclusion

1. INTRODUCTION

The growing presence of Artificial Intelligence (AI) in education has introduced possibilities that extend beyond the automation of conventional teaching practices. For students with disabilities, intelligent systems can support communication, accessibility, personalization, and different forms of interaction with educational content, potentially reducing barriers that have historically restricted participation in learning environments. Yet the significance of these technologies cannot be measured solely by their technical capabilities. In special and inclusive education, innovation acquires educational value when it contributes to the recognition of human diversity and expands the conditions under which every student can participate, learn, and exercise autonomy (United Nations, 2006; UNESCO, 2023).

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This perspective places inclusion within a broader rights-based understanding of education. Access to a school, platform, or digital resource does not necessarily ensure meaningful participation when pedagogical practices, institutional structures, or technological systems remain designed around assumptions of a supposedly standard learner. Digital transformation may therefore reduce certain barriers while simultaneously reproducing others, particularly when inequalities in accessibility, infrastructure, professional preparation, and technological participation are insufficiently addressed (Almeida, 2025). The challenge is consequently not only to introduce technology into inclusive education, but to determine whose needs are recognized when educational technologies are conceived, implemented, and evaluated.

Artificial Intelligence intensifies this question because algorithmic systems are shaped by data, classifications, design choices, and assumptions about the people for whom they are intended. When disability is inadequately represented within these processes, technological systems may reproduce forms of exclusion even when developed to increase efficiency or personalization. Newman-Griffis et al. (2022) demonstrate that the conceptual models through which disability is defined can directly influence AI design and the mechanisms through which algorithmic bias emerges. From this standpoint, an inclusive algorithm cannot be understood merely as one that performs accurately; it must also be examined according to its capacity to accommodate forms of human functioning that may differ from the patterns represented in its design.

At the same time, emerging evidence indicates that AI can contribute meaningfully to the education of students with disabilities when technological resources are connected to accessibility, pedagogical purpose, and appropriate support. AI-driven assistive technologies may facilitate access to information, communication, adaptive learning, and participation, although their educational adoption also raises challenges involving equity, privacy, professional preparation, and governance (Kooli & Chakraoui, 2025). Recent research further suggests that the effects of AI on students with disabilities cannot be separated from the conditions under which these systems are introduced into educational environments, including students' perceptions, engagement, and the capacity of educators to mediate their use (Alruwaili, 2026).

Such possibilities make human mediation more important rather than obsolete. Inclusive education involves relationships, contextual judgment, collaboration, and knowledge of individual learning needs that cannot be reduced to computational prediction. AI may identify patterns and provide adaptive responses, but decisions concerning educational goals, accommodations, participation, and pedagogical meaning remain embedded in human and institutional responsibilities. Accordingly, ethical principles for AI emphasize human rights, diversity, fairness, transparency, and human oversight as fundamental conditions for technological development and deployment (UNESCO, 2022). Within education, these principles require technological innovation to be assessed not only according to what systems can accomplish, but also according to whom they serve, whom they may overlook, and how their consequences are governed.

This concern has become increasingly relevant as inclusive education and AI move from parallel agendas toward a shared field of educational practice. Recent developments involving Universal Design for Learning, assistive technologies, adaptive systems, and AI-supported educational resources suggest opportunities to design learning environments that respond more flexibly to learner variability (Ayuso-del Puerto et al., 2026). In Brazil, this movement also occurs within an evolving policy framework for inclusive special education, reinforcing the institutional responsibility to ensure participation, accessibility, and appropriate educational support for students who constitute the target population of special education (Brasil, 2025). Technology, in this context, becomes consequential not because it is sophisticated, but because its design and pedagogical use can either widen or narrow the possibilities of inclusion.

Against this background, this study examines the relationship between Artificial Intelligence, special education, and educational inclusion, with particular attention to the conditions under which algorithmic technologies can support rather than reproduce exclusion. The study aims to analyze the possibilities, limitations, and educational implications of AI and assistive technologies for students with disabilities, considering accessibility, algorithmic bias, Universal Design for Learning, teacher mediation, and ethical responsibility. The article is organized into five sections. Following this introduction, the theoretical framework addresses the conceptual foundations connecting disability, inclusion, assistive technologies, and Artificial Intelligence. The methodological section subsequently describes the procedures adopted for the study. The findings are then presented and discussed in relation to the educational and ethical conditions required for more inclusive technological practices, followed by the concluding remarks.

2. THEORETICAL BACKGROUND

Understanding the relationship between special education, inclusion, and Artificial Intelligence requires moving beyond a predominantly technological interpretation of educational accessibility. Inclusion concerns the conditions under which differences are recognized within educational systems and translated into meaningful opportunities for participation, learning, communication, and autonomy. From this perspective, technology becomes relevant not simply because it enables new forms of interaction, but because its design and pedagogical use can influence which learners are recognized, which needs are accommodated, and which barriers remain embedded in educational environments.

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This understanding becomes particularly important as AI-supported systems increasingly mediate access to information, communication, assessment, and personalized learning. The educational possibilities created by these technologies coexist with questions concerning accessibility, representation, algorithmic bias, professional preparation, and human oversight. Accordingly, the theoretical background is organized into three interconnected dimensions. The first examines disability and inclusive education from a rights-based perspective. The second discusses assistive technologies, Universal Design for Learning, and teacher mediation as foundations for accessible learning environments. The third addresses Artificial Intelligence in relation to disability, examining how algorithmic systems can support inclusion while also reproducing forms of exclusion when human diversity is insufficiently represented in their design.

2.1 Disability, Educational Rights, and the Meaning of Inclusion

Inclusive education is grounded in the recognition that disability should not constitute a reason for restricting participation in educational opportunities. The Convention on the Rights of Persons with Disabilities established an important international framework by affirming the right of persons with disabilities to education without discrimination and on the basis of equal opportunity (United Nations, 2006). This principle shifts educational responsibility away from expecting individuals to adapt to inflexible environments and toward creating conditions in which diversity can be accommodated within educational structures, practices, and resources.

Such a perspective broadens the meaning of accessibility. Physical access remains essential, but educational participation also depends on communicational, pedagogical, digital, and attitudinal conditions. Consequently, the presence of a student within an educational institution does not, by itself, characterize inclusion. Meaningful inclusion requires opportunities to engage with curricular content, communicate, participate in learning activities, interact with others, and develop autonomy according to individual characteristics and educational needs.

Digital transformation adds another layer to this responsibility. Technologies can remove barriers by providing alternative forms of communication, representation, interaction, and access to educational materials. However, they can also generate new forms of inequality when accessibility is treated as an additional feature rather than a principle incorporated into educational design. Almeida (2025) draws attention to the relationship between technological expansion, inclusion, and inequalities in digital learning contexts, indicating that increased technological availability does not automatically result in equitable educational participation. Access must therefore be considered together with the conditions under which technologies can actually be used by different learners.

This distinction becomes especially relevant because inclusive education is not produced by technological resources in isolation. It depends on institutional organization, pedagogical practices, professional knowledge, and collaborative relationships capable of responding to learner variability. Leal et al. (2026) emphasize the importance of collaborative work in special education, demonstrating the relevance of articulating different forms of professional knowledge in support of school inclusion. Such collaboration reinforces the understanding that educational needs should not be addressed through fragmented interventions, but through coordinated practices capable of connecting students, teachers, specialized support, families, and institutional structures. In Brazil, this responsibility is reinforced by the National Policy on Inclusive Special Education and the National Network for Inclusive Special Education, established by Decree No. 12,686/2025 (Brasil, 2025). The policy framework strengthens the institutional commitment to ensuring educational participation and appropriate support for the target population of special education. Within an increasingly digital educational landscape, this commitment also requires attention to the accessibility of technological environments, since exclusion can migrate from physical spaces to interfaces, platforms, automated systems, and digital learning resources.

Inclusion, therefore, cannot be reduced to the presence of technology or even to access to it. Its meaning lies in the capacity of educational systems to recognize variability without converting difference into disadvantage. This principle provides the conceptual foundation for examining assistive technologies and Universal Design for Learning, both of which seek to reduce barriers by expanding the ways in which learners can access, participate in, and respond to educational experiences.

2.2 Assistive Technologies, Universal Design for Learning, and Teacher Mediation

Assistive technology occupies a significant position within inclusive education because it can increase functional possibilities and facilitate participation in activities that might otherwise remain inaccessible. In educational settings, its relevance extends beyond the characteristics of a particular device or software. Its effectiveness depends on the relationship between the resource, the learner, the educational task, and the environment in which interaction occurs. Technology becomes assistive in an educational sense when it contributes to overcoming barriers and enables students to participate more autonomously in learning processes.

Raviccini et al. (2026) associate assistive technology with both possibilities and challenges in inclusive teaching practice, reinforcing the need to connect technological resources with pedagogical decisions. This relationship is fundamental because the

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same resource may produce different educational outcomes according to how, why, and for whom it is used. Accessibility therefore requires more than technical availability; it requires pedagogical intentionality and knowledge of the learner.

Universal Design for Learning (UDL) extends this reasoning by encouraging educational environments to anticipate learner variability rather than responding to difference only after barriers become visible. Its relevance to technology-enhanced education lies in the possibility of designing learning experiences that provide greater flexibility in access, participation, and engagement. Instead of constructing a single instructional pathway and subsequently creating exceptions for students who cannot follow it, a universal design perspective encourages flexibility to be incorporated into educational planning from the beginning.

The relationship between UDL and Artificial Intelligence has expanded this possibility. Mallary et al. (2025) discuss how AI and UDL can contribute to transforming teaching and learning by supporting more adaptable educational experiences. More recently, Ayuso-del Puerto et al. (2026) examined knowledge, perceptions, and the applicability of UDL and AI within inclusive education, indicating the growing proximity between universal design principles and intelligent educational technologies. This intersection is particularly relevant because AI can increase the capacity of digital environments to offer different forms of representation, interaction, and support according to learners' needs.

Nevertheless, adaptability should not be confused with inclusion automatically produced by an algorithm. The educational value of personalization depends on the pedagogical purposes guiding it and on the quality of the decisions surrounding its use. A system capable of adapting content may facilitate access, but inclusion also involves belonging, participation, relationships, expectations, and recognition. These dimensions require contextual understanding that cannot be delegated entirely to automated processes.

Teacher mediation consequently remains central. Sousa et al. (2025) argue that Artificial Intelligence should operate as a means that supports learning rather than as an end in itself, preserving the teacher's role as mediator of the pedagogical process. In special education, this principle acquires additional importance because educators frequently need to interpret individual responses, identify barriers, coordinate support, and adjust strategies according to circumstances that technological systems may not adequately capture.

This responsibility also places teacher preparation at the center of technological inclusion. Frederico et al. (2026) identify challenges associated with teacher education for inclusive practice, highlighting the importance of professional preparation for responding to diverse educational needs. As AI and assistive technologies become increasingly interconnected, educators require not only technical competence but also the capacity to evaluate accessibility, pedagogical suitability, ethical implications, and the limitations of automated recommendations. The question therefore shifts from whether teachers can use intelligent technologies to whether they can make informed decisions about when, why, and under what conditions these technologies contribute to inclusion.

2.3 Artificial Intelligence, Disability, and Algorithmic Inclusion

Artificial Intelligence introduces a distinctive challenge to inclusive education because intelligent systems do not merely provide access to information; they classify, predict, recommend, generate, and adapt. These functions can substantially expand educational support for students with disabilities, particularly when AI is integrated with assistive technologies capable of facilitating communication, access to content, interaction, and individualized educational experiences. Kooli and Chakraoui (2025) identify important benefits associated with AI-driven assistive technologies while also emphasizing challenges and the need for appropriate policy responses.

The potential of these systems is particularly significant when conventional educational resources do not adequately respond to learner variability. AI-supported technologies may contribute to more flexible forms of access and interaction, allowing educational resources to respond to different needs rather than requiring all students to engage with identical formats and pathways. Alruwaili (2026) examines the impact of AI technologies on the education of students with disabilities by considering perceptions, challenges, and student engagement, illustrating how technological effectiveness must be understood in relation to the experiences of those expected to benefit from it.

Yet personalization does not eliminate the problem of representation. Every intelligent system operates through assumptions embedded in its development, including decisions concerning data, categories, objectives, and measures of successful performance. Newman-Griffis et al. (2022) demonstrate that the ways disability is conceptualized can influence technological design and generate mechanisms of bias within AI systems. This relationship is fundamental to inclusive education: when technologies are developed around narrow representations of human functioning, individuals whose characteristics fall outside dominant patterns may experience reduced system performance, inappropriate classifications, or forms of technological exclusion. Algorithmic inclusion therefore requires more than correcting technical errors after deployment. It requires examining how human variability is represented from the earliest stages of technological conception and how people with disabilities participate in decisions concerning technologies that affect them. In this sense, the expression “tuned algorithms” acquires a broader educational

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meaning. An algorithm becomes more responsive to inclusion not merely when its predictions become more precise, but when the assumptions, data, interfaces, and purposes underlying its operation are aligned with diverse forms of participation and learning. This requirement connects technological design directly with ethics. UNESCO (2022) establishes respect for human rights, fairness, non-discrimination, transparency, accountability, and human oversight among the central principles for ethical Artificial Intelligence. Applied to special education, these principles require particular attention because algorithmic decisions may influence access, support, assessment, communication, and educational expectations for students whose needs have historically been insufficiently represented in technological development.

The issue is therefore not whether Artificial Intelligence should participate in inclusive education, but under which educational and ethical conditions its participation can expand opportunities without transforming difference into computational disadvantage. UNESCO (2023) cautions that educational technology should be evaluated according to whose interests it serves and under what conditions it contributes to education. For students with disabilities, this question acquires concrete significance: a technologically advanced system cannot be considered genuinely inclusive if its operation creates barriers for the very learners it is expected to support.

From this perspective, the future of AI-supported special education depends on the articulation of technological capability with accessible design, professional mediation, ethical governance, and the recognition of disability as part of human diversity. Algorithms may contribute to more responsive educational environments, but inclusion ultimately depends on whether educational systems are prepared to listen to experiences that technological development has not always adequately represented. The challenge is thus not simply to make Artificial Intelligence more powerful, but to ensure that its increasing power is directed toward educational participation, autonomy, and dignity.

3. METHODOLOGY

This study adopts a qualitative research design based on an integrative literature review, selected for its capacity to bring together theoretical, empirical, normative, and institutional contributions concerning the intersection of special education, educational inclusion, and Artificial Intelligence. The methodological approach was considered appropriate because the phenomenon investigated involves dimensions that cannot be adequately understood through technological performance alone. Questions of accessibility, disability, pedagogical mediation, assistive technology, algorithmic representation, and ethical responsibility require the articulation of educational, technological, and rights-based perspectives.

The review considered peer-reviewed scientific publications and official institutional documents directly related to the objectives of the study. The selected material addressed special and inclusive education, disability, assistive technologies, Universal Design for Learning, Artificial Intelligence in education, algorithmic bias, teacher preparation, accessibility, and ethical governance. Institutional and normative documents were incorporated when they contributed to establishing principles concerning educational rights, inclusive policies, and responsible technological development. Priority was given to sources with direct conceptual or empirical relevance to the relationship between AI and the educational participation of students with disabilities.

The search strategy was structured around descriptors corresponding to the principal concepts investigated, including special education, inclusive education, disability, students with disabilities, assistive technology, Universal Design for Learning, Artificial Intelligence, AI in education, algorithmic bias, accessibility, and teacher education. These terms were considered individually and in combinations capable of identifying studies situated at the intersection of technological development and inclusive educational practice. The search strategy was designed to encompass both the potential contribution of intelligent technologies to accessibility and learning and the educational, ethical, and representational challenges associated with their implementation.

The examination of the identified material followed successive stages of relevance assessment. Titles, abstracts, and keywords were initially considered in relation to the study objective. Publications demonstrating direct relevance to the investigated themes were subsequently examined in full, with attention to their theoretical assumptions, methodological characteristics, principal findings, and implications for inclusive educational practice. Sources whose focus did not contribute directly to understanding the relationship among disability, inclusion, educational technology, and Artificial Intelligence were not incorporated into the interpretative corpus.

The selected material was then organized through thematic synthesis. Rather than treating technological resources as an isolated analytical category, the interpretation sought to identify relationships among educational rights, accessibility, pedagogical mediation, technological design, and algorithmic decision-making. Three interconnected analytical dimensions guided this process: disability and inclusion as educational and human-rights concerns; assistive technologies, Universal Design for Learning, and teacher mediation as conditions for accessible educational participation; and Artificial Intelligence as both a potential instrument of inclusion and a technological environment susceptible to representational and algorithmic bias. This organization maintained continuity between the theoretical framework and the interpretation of the evidence.

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Particular attention was given to the distinction between technological availability and effective educational inclusion. During the interpretative process, evidence concerning accessibility, personalization, student engagement, professional preparation, collaborative practices, algorithmic representation, ethical principles, and human oversight was considered in relation to the conditions under which AI-supported technologies may expand or restrict educational participation. This procedure enabled the review to move beyond a descriptive inventory of technological applications and toward an integrated interpretation of the educational conditions that influence their inclusive potential.

Because the study relies on bibliographic and documentary evidence, its conclusions are bounded by the scope, methodological characteristics, and contexts of the sources included in the review. The findings should therefore be interpreted as a synthesis of the educational, technological, and ethical dimensions identified in the examined evidence rather than as direct measurement of the effectiveness of a particular AI system or intervention. Within these boundaries, the methodological approach provides a structured basis for examining how Artificial Intelligence can contribute to special and inclusive education while preserving accessibility, human mediation, educational rights, and respect for learner diversity.

4. RESULTS AND DISCUSSION

The evidence synthesized in this review indicates that the relationship between Artificial Intelligence and inclusive education is characterized by a fundamental tension. Intelligent technologies can expand accessibility, communication, personalization, and participation for students with disabilities, yet these possibilities do not make AI inherently inclusive. Their educational value depends on how disability is represented in technological design, how systems respond to learner variability, how teachers mediate their use, and how institutions govern the consequences of algorithmic decisions. Inclusion therefore emerges not as an automatic outcome of technological advancement, but as a condition that must be deliberately incorporated into the design, implementation, and evaluation of AI-supported educational environments.

This distinction is particularly important when the available evidence on AI and students with disabilities is considered. Zhang et al. (2026), in their systematic literature review and meta-analysis, provide a broad synthesis of research concerning Artificial Intelligence for students with disabilities, demonstrating the growing relevance of intelligent technologies within this educational field. Their contribution strengthens the argument that AI should no longer be treated as a peripheral issue in special education. At the same time, the existence of measurable technological or educational effects does not eliminate the need to examine the conditions under which these effects are produced. Alruwaili (2026) complements this perspective by directing attention to students' perceptions, challenges, and engagement, thereby shifting part of the evaluative focus from what a technological system is capable of performing to how students actually experience its presence in education.

This shift from technological capability to educational experience represents one of the most significant findings of the synthesis. AI-supported tools can facilitate interaction with content, provide alternative forms of access, support communication, and adapt aspects of educational experiences. Kooli and Chakraoui (2025) identify substantial possibilities associated with AI-driven assistive technologies while simultaneously emphasizing challenges and policy requirements. Raviccini et al. (2026), from the perspective of assistive technology in inclusive education, similarly demonstrate that technological resources acquire significance through their relationship with teaching practice. Considered together, these contributions indicate that accessibility cannot be treated as a property residing exclusively within a device or algorithm. It is produced through the interaction among technological functionality, individual needs, pedagogical objectives, and the educational environment.

This finding changes the meaning of personalization within inclusive education. Adaptive systems are frequently valued because they can modify content, feedback, pace, or interaction according to user characteristics. However, personalization becomes educationally relevant only when adaptation increases meaningful participation rather than simply creating different computational pathways. Mallary et al. (2025) connect AI with Universal Design for Learning and indicate possibilities for more flexible teaching and learning environments, while Ayuso-del Puerto et al. (2026) extend this discussion by examining the knowledge, perceptions, and applicability of UDL and AI within inclusive education. Together, these studies suggest a transition from reactive accommodation toward educational environments designed from the outset to respond to learner variability.

The implications of this transition are considerable. Traditional approaches may identify a dominant instructional pathway and subsequently introduce adaptations for students who encounter barriers. The intersection between UDL and AI creates the possibility of reversing this logic: variability can become an anticipated characteristic of educational design rather than an exception requiring later correction. Nevertheless, algorithmic adaptability and universal design should not be considered synonymous. An AI system may personalize an experience while still relying on assumptions, categories, or data that inadequately represent disability. Consequently, technological responsiveness must be evaluated not only according to whether a system adapts, but according to what it recognizes as relevant variation and whose characteristics informed the parameters through which adaptation occurs.

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It is at this point that the problem of algorithmic representation becomes central. Newman-Griffis et al. (2022) demonstrate that definitions and models of disability influence AI design and can generate specific mechanisms of technological bias. This finding has direct educational implications. If disability is represented primarily as deviation from a presumed standard of functioning, an intelligent system may reproduce that assumption through classifications, recommendations, predictions, or interface decisions. What appears technically neutral may therefore incorporate normative expectations about communication, cognition, behavior, performance, or interaction.

The consequences extend beyond conventional interpretations of algorithmic accuracy. In inclusive education, a system may perform adequately for the majority of users while remaining poorly responsive to individuals whose characteristics are underrepresented in the data or assumptions informing its development. Almeida (2025) provides an important complementary perspective by associating educational technology with continuing challenges of inclusion and inequality in digital learning contexts. The synthesis of these contributions suggests that digital exclusion can persist even after physical access to technology has been achieved. The barrier may no longer be the absence of a device; it may reside within the logic through which the device recognizes, interprets, or responds to its user.

Table 1 – Interpretative synthesis of conditions influencing AI-supported inclusion in education

Dimension	Inclusive potential	Condition required	Risk when insufficiently addressed
Accessibility and assistive technology	Expands possibilities for communication, interaction, and access to educational content	Alignment among technological functionality, learner needs, and pedagogical objectives	Availability of technology without effective educational participation
AI-supported personalization	Enables more adaptable learning experiences and differentiated forms of support	Personalization grounded in educational purpose and learner variability	Automated differentiation that reproduces narrow assumptions about learners
Universal Design for Learning	Encourages flexibility to be incorporated into educational environments from the outset	Integration of multiple possibilities for access, engagement, and participation	Treating accessibility as a later accommodation rather than a design principle
Teacher mediation	Enables contextual interpretation and pedagogically appropriate use of technological recommendations	Professional preparation for inclusive, technological, and ethical decision-making	Excessive dependence on automated recommendations or technically driven practices
Algorithmic representation	Creates the possibility of systems that respond to a wider range of human characteristics	Appropriate representation of disability and examination of design assumptions	Bias, inappropriate classification, reduced responsiveness, or computational exclusion
Ethical and institutional governance	Protects rights while establishing responsibility for technological decisions	Transparency, accountability, human oversight, accessibility, and non-discrimination	Technological deployment without clear responsibility for educational consequences

Source: Prepared by the authors based on the evidence synthesized in the review.

Table 1 demonstrates that the inclusive potential of AI is relational rather than intrinsic. Each technological possibility corresponds to a condition that determines whether that possibility can become educationally meaningful. Accessibility requires alignment with actual learner needs; personalization requires pedagogical purpose; UDL requires anticipatory flexibility; teacher mediation requires professional preparation; algorithmic representation requires attention to disability within design; and technological deployment requires ethical and institutional governance. This relationship helps explain why identical technologies may produce different consequences across educational contexts and student populations.

Teacher preparation occupies a particularly important position within this framework because educators frequently mediate the boundary between algorithmic recommendations and individual educational realities. Frederico et al. (2026) emphasize challenges in teacher preparation for inclusive education, while Sousa et al. (2025) argue that AI should remain a means of supporting learning while teachers preserve their mediating role. When these perspectives are considered together, technological competence alone appears insufficient. Teachers working in AI-supported inclusive environments require the ability to judge whether an

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automated recommendation is pedagogically appropriate, whether a technological adaptation responds to the student's actual needs, and whether a system may be introducing barriers that are not immediately visible through its interface.

This does not imply transferring responsibility for algorithmic limitations to teachers. On the contrary, the evidence suggests that inclusive AI requires distributed responsibility. Developers influence how disability is represented and how systems operate; institutions determine procurement, implementation, support, and accountability mechanisms; educators interpret technological outputs within pedagogical contexts; and educational policies establish rights and obligations that should constrain technological deployment. Collaborative practice, emphasized by Leal et al. (2026) in special education, becomes particularly relevant under these conditions because increasingly complex technological environments require dialogue among professionals with different forms of expertise rather than isolated decision-making.

The policy dimension reinforces this interpretation. In Brazil, Decree No. 12,686/2025 establishes the National Policy on Inclusive Special Education and the National Network for Inclusive Special Education, strengthening institutional responsibility for educational participation and support (Brasil, 2025). At the international level, the Convention on the Rights of Persons with Disabilities establishes inclusive education as a right rather than a discretionary technological objective (United Nations, 2006). Read together, these frameworks establish an important hierarchy: technological innovation must operate within educational rights, rather than requiring educational rights to adapt to the limitations of technological systems.

Ethical governance becomes indispensable precisely because AI introduces forms of mediation that may not always be visible to students or educators. UNESCO (2022) identifies human rights, fairness, non-discrimination, transparency, accountability, and human oversight as essential principles for ethical AI. These principles become operational concerns in special education when intelligent systems participate in processes involving adaptation, assessment, recommendation, communication, or access. Transparency, for example, is not merely a technical characteristic when an automated decision influences the educational experience of a student with a disability; it is part of the capacity to understand, question, and, when necessary, override technological decisions.

The UNESCO Global Education Monitoring Report further asks a question particularly relevant to this study by examining technology in education in terms of whose interests and conditions guide its use (UNESCO, 2023). Applied to AI and disability, this question redirects attention toward participation in technological development itself. If intelligent educational systems are intended to respond to human diversity, the experiences of persons with disabilities cannot remain peripheral to the processes through which technological priorities, datasets, interfaces, evaluation criteria, and definitions of successful performance are established. Inclusion at the point of use is weakened when exclusion has already occurred at the point of design.

The synthesis therefore supports a distinction among three levels of technological inclusion. The first is **access**, in which students are able to reach and use technological resources. The second is **adaptation**, in which systems provide differentiated forms of interaction or support. The third is **recognition**, in which learner diversity influences the assumptions through which technologies are designed, evaluated, and governed. Access without adaptation may leave educational barriers intact; adaptation without adequate recognition may automate incomplete understandings of disability. More robust inclusion emerges when these three levels operate together under pedagogical and ethical oversight.

This distinction provides a conceptual interpretation of what may be understood as **tuned algorithms** within inclusive education. The expression does not refer simply to technically optimized models. Rather, it describes an orientation in which intelligent systems are progressively aligned with learner variability, accessibility requirements, educational purposes, and the rights of persons with disabilities. Such alignment requires technical improvement, but it also requires pedagogical judgment, representative design, institutional responsibility, and opportunities for those affected by technological systems to influence how those systems are developed and used.

Overall, the findings indicate that the most consequential transformation produced by AI in special education may not lie in making educational technologies increasingly autonomous, but in making them increasingly responsive to forms of human diversity that standardized technological systems have historically struggled to accommodate. The evidence does not support treating AI as a substitute for teachers, assistive relationships, collaborative practices, or inclusive educational policy. Instead, its strongest potential emerges when technological capability is subordinated to educational participation and human agency. In this sense, the future described in the title of this study begins to “listen” not when algorithms independently understand disability, but when technological design, educational practice, and institutional governance become capable of incorporating voices, needs, and forms of participation that computational systems have too often failed to recognize.

5. CONCLUSION

This study examined the relationship between Artificial Intelligence, special education, and educational inclusion, focusing on the conditions under which intelligent and assistive technologies can expand educational participation without reproducing existing forms of exclusion. The evidence synthesized throughout the review indicates that AI can support accessibility, communication,

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personalization, interaction, and differentiated learning experiences for students with disabilities. These possibilities, however, do not make technological systems inherently inclusive. Their educational significance depends on how disability is represented in technological design, how learner variability is accommodated, how teachers mediate technological use, and how institutions assume responsibility for its consequences.

A central contribution of the study lies in distinguishing three interconnected levels of technological inclusion: access, adaptation, and recognition. Access enables students to reach and use technological resources; adaptation allows educational experiences to respond more flexibly to individual characteristics and needs; recognition goes further by requiring learner diversity to influence the assumptions, data, design choices, evaluation criteria, and governance structures underlying technological systems. This distinction demonstrates that providing access to AI is insufficient when the systems themselves remain poorly prepared to recognize the diversity of those who use them.

The findings also reinforce the complementary relationship among assistive technology, Universal Design for Learning, and teacher mediation. AI can increase the adaptability of educational environments, but personalization does not replace pedagogical judgment, collaborative practice, or knowledge of individual learners. Teachers therefore remain essential not despite the increasing sophistication of intelligent systems, but partly because of it. As technological recommendations become more influential, professional capacity to interpret, question, contextualize, and, when necessary, override automated outputs becomes an increasingly important dimension of inclusive educational practice.

At the same time, responsibility for inclusion cannot be transferred exclusively to educators or students. Algorithmic systems are shaped by decisions concerning data, classifications, interfaces, objectives, and representations of human functioning. Inclusive AI consequently requires responsibility across technological development, educational institutions, professional practice, and public governance. Ethical principles such as transparency, accountability, non-discrimination, accessibility, and human oversight become practical requirements when intelligent systems participate in decisions and interactions that affect the educational experiences of students with disabilities.

Within these conditions, the concept of tuned algorithms proposed in this study acquires its broader meaning. It does not describe algorithms that are merely more technically accurate or computationally efficient. It refers to an orientation toward intelligent systems whose development and educational use are progressively aligned with human variability, accessibility, educational purpose, and the rights of persons with disabilities. The movement from access to adaptation and from adaptation to recognition therefore represents not only technological improvement, but a change in how inclusion itself is understood within AI-supported education.

The study is bounded by its bibliographic and documentary design and therefore does not measure the effectiveness of a specific AI intervention or technological system. Its contribution lies instead in integrating educational, technological, ethical, and rights-based evidence into a framework for understanding the conditions under which Artificial Intelligence can support more inclusive educational environments. This boundary is particularly important because technological effectiveness and educational inclusion should not be treated as equivalent outcomes.

Ultimately, the future of Artificial Intelligence in special education will not be determined solely by how accurately algorithms predict, classify, generate, or adapt. It will also depend on whether educational and technological systems become capable of recognizing forms of human diversity that standardized models have historically failed to accommodate. The most meaningful advance, therefore, may occur when technology ceases to require learners to approximate the logic of the system and the system becomes more capable of responding to the realities of its learners. In that movement, inclusion is no longer an adjustment made after technological development; it becomes one of the principles through which the future itself is designed.

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