The Role of Technology in Inclusive Education: A PRISMA 2020 Systematic Review

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Abstract

Technological advancement is transforming educational practice, reshaping how learners engage with content and how educators design instruction for increasingly diverse classrooms. Rapid digitalisation therefore demands rigorous inquiry into how technology intersects with inclusive pedagogy to address learner heterogeneity and reduce persistent classroom inequities. This study used a PRISMA 2020 systematic review methodology to examine the benefits and limitations of technology in inclusive classroom contexts, systematically searching the ERIC database and Google Scholar for peer-reviewed articles published between 2023 and 2025. Fifteen studies met the eligibility criteria and were included in the qualitative synthesis. The findings indicate that technological tools enhance student engagement, knowledge retention, and tolerance for variation in individual learning pace, while fostering more inclusive and equitable learning environments. Educators who integrate digital technologies strategically also tend to cultivate soft skills that expand learners' future employment competencies. Conversely, over-reliance on digital tools may impede the development of independent thinking, sustained focus, and higher-order cognitive capacities such as critical thinking and creativity. The review therefore recommends that governments, curriculum developers, and initial teacher education institutions redesign educational programmes to address the diverse needs of all learners in mainstream classrooms, and that ongoing professional development equip educators with the digital pedagogical competencies required to deploy technology in ethically responsible, contextually appropriate, and pedagogically effective ways. These findings carry important implications for educational policy and practice in the Global South, where the tension between digital opportunity and infrastructural constraint remains acute.

Keywords: inclusive education, digital pedagogy, learner diversity, artificial intelligence, PRISMA 2020 systematic review

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Introduction

Addressing learner diversity remains one of the most persistent and complex challenges in contemporary education. In many school contexts, learners with learning difficulties, disabilities, or socioeconomic disadvantages are disproportionately excluded from meaningful participation in mainstream classrooms, and some ultimately abandon formal schooling altogether because of insufficient systemic support (Fitas, 2025). The emergence of digital technologies as pedagogical tools has, however, opened new possibilities for mitigating these longstanding inequities. Technological advancement and the accelerating adoption of digital tools across multiple sectors have fundamentally altered the educational landscape, displacing rigid, one-size-fits-all instructional paradigms in favour of personalised, adaptive learning experiences (Gupta & Kaul, 2024; Pratama et al., 2023).

The theoretical grounding of inclusive education draws on the principles enshrined in the United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2006) and the Salamanca Statement (UNESCO, 1994), both of which mandate that educational systems accommodate all learners regardless of ability, background, or learning profile. Technology, when purposefully deployed, has the potential to operationalise these principles at the classroom level by providing differentiated, multimodal, and accessible learning pathways (Alharbi, 2024; Salas-Pilco et al., 2022). As Florian and Spratt (2013) argue, truly inclusive pedagogy requires moving beyond individualised accommodation towards universal approaches that benefit all learners, a goal that digital tools are increasingly well positioned to support.

Despite this promise, the evidence base remains fragmented, and critical questions persist regarding the conditions under which technology reliably promotes inclusion, the competencies educators require to harness its potential, and the ethical risks it introduces, particularly in resource-constrained contexts. This study addresses these gaps through a systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework (Page et al., 2021). The central research question guiding this inquiry is: what does the current literature reveal about the benefits and limitations of technology in supporting inclusive education in diverse classroom contexts? By synthesising recent empirical and theoretical evidence, this review aims to inform educational policy, initial teacher education, and classroom practice, with particular sensitivity to equity concerns in the Global South.

Theoretical Framework and Literature Review

Conceptualising Inclusive Education and Technology

Inclusive education is a multidimensional construct that extends beyond the physical placement of learners with special educational needs in mainstream classrooms. It represents a systemic commitment to recognising, valuing, and responding to the full diversity of learners, encompassing differences in ability, language, culture, socioeconomic status, and learning profile (Ainscow et al., 2006). These challenges are not confined to basic education: Moriña (2017) shows that similar barriers to full participation persist within higher education, which underscores the pervasiveness of exclusionary practice across the education continuum. Technology, in this context, is not a neutral instrument; it is a socio-technical artefact whose educational value is determined by the pedagogical frameworks within which it is embedded (Selwyn, 2016). Accordingly, any rigorous evaluation of technology's role in inclusive

education must attend not only to the affordances of specific tools but also to the institutional, curricular, and professional conditions that mediate their use.

The Universal Design for Learning (UDL) framework (CAST, 2018) provides a particularly useful theoretical lens for this inquiry. UDL posits that educational barriers are systemic rather than individual, and it advocates for the proactive design of flexible learning environments that offer multiple means of engagement, representation, and action and expression. Digital technologies, when designed and deployed in alignment with UDL principles, have demonstrated a substantial capacity to reduce such barriers by offering learners alternative modalities of engagement and self-expression (Hitchcock et al., 2002; Rose & Meyer, 2002). This review draws on UDL as an analytical frame through which to evaluate the extent to which the reviewed literature reflects genuinely inclusive, rather than merely adaptive, uses of technology.

Benefits of Technology in Inclusive Education

A growing body of scholarship affirms that technology exerts a positive influence on learner engagement, knowledge retention, and the accommodation of individual learning pace, while simultaneously fostering more inclusive and equitable educational environments (Fitas, 2025; Pratama et al., 2023). Researchers increasingly conceptualise digital tools as indispensable instruments for transforming education into a system capable of providing customised solutions that accommodate diverse learning profiles (Alharbi, 2024). Generative artificial intelligence tools such as ChatGPT, for example, have been shown to support teaching and learning by offering learners personalised explanations and timely academic assistance (Baidoo-Anu & Ansah, 2023). Educators can harness such tools to build adaptive learning systems that improve performance outcomes, enhance motivation, and increase learner participation and satisfaction (Pratama et al., 2023).

The transformative potential of technology in inclusive contexts is particularly evident in its capacity to dismantle structural inequities. Digital technologies can attenuate the unequal treatment of learners in heterogeneous classrooms by providing differentiated pathways to the curriculum (Julien, 2024), a capacity that Iweuno et al. (2024) similarly identify as central to leveraging artificial intelligence for a more diversified and representative curriculum. Bai (2025) cautions, however, that educators must exercise critical scrutiny regarding the accuracy and contextual appropriateness of digital technologies, because uncritical adoption risks replicating or amplifying existing educational inequalities. A fundamental shift in pedagogical orientation is therefore required, one that moves beyond the superficial integration of digital tools towards the development of robust digital pedagogical competencies among educators.

This imperative is reflected at the international policy level. In 2024, UNESCO published its Artificial Intelligence Competency Framework for Teachers (AI CFT), which articulates the foundational principles, values, and critical skills that educators require to understand and deploy technology in ethical, effective, safe, and responsible ways (Bai, 2025; Cukurova & Miao, 2024). The AI CFT organises teachers' technological competencies across three progressive developmental levels, namely acquire, deepen, and create, within a human-centred value framework that foregrounds human agency, accountability, and self-determination (UNESCO, 2024). The framework's emphasis on contextualised competency development is particularly pertinent given that a 2023 UNESCO survey identified only seven countries with national framework programmes for training educators in digital pedagogical practice

(Cukurova & Miao, 2024), a finding that underscores the scale of the professional development challenge confronting education systems globally.

Julien (2024) argues persuasively that digital teaching tools enhance the delivery of curriculum content in ways that respond to diverse learning needs, thereby enabling educators to bridge persistent gaps in educational equity and inclusion. This argument is supported by Holmes (2020), who demonstrates that prompt, targeted digital feedback loops enable learners to identify and address knowledge gaps with greater immediacy and precision, thereby enhancing learning outcomes and classroom communication. The use of digital tools further fosters equitable, inclusive, and culturally sensitive educational environments (Dogan et al., 2025; Estrada et al., 2025), while simultaneously empowering teachers to sharpen their own technological competencies and automate administrative tasks, freeing professional attention for higher-order pedagogical functions.

The evidence for technology's benefits in inclusive education is further strengthened by recent findings on learner self-regulation and intrinsic motivation. Bai (2025) observes that technology is reconfiguring the landscape of education across a spectrum of dimensions, from self-regulated and personalised learning to fundamental pedagogical shifts across disciplines. Yuan and Liu (2025) corroborate this claim, demonstrating that AI-mediated tools significantly enhance the engagement, enjoyment, and motivation of learners of English as a foreign language, which suggests broad transferability across subject domains. Song et al. (2024) and Ma et al. (2025) further establish that digital tools possess a considerable capacity to capture learner attention and sustain active participation, findings that carry particular significance for learners who have historically been disengaged from mainstream educational provision.

Ethical Challenges and Limitations

Notwithstanding these considerable affordances, the integration of technology in inclusive education is not without significant ethical and pedagogical challenges. Several scholars have raised substantive concerns regarding data privacy, algorithmic bias, and the potential for digital tools to exacerbate rather than ameliorate educational inequities (Hossain et al., 2024; Reina-Parrado et al., 2025). Algorithmic systems embedded in adaptive learning platforms are frequently trained on datasets that inadequately represent the diversity of learners, particularly those from minority linguistic, cultural, and socioeconomic backgrounds, and this risks reproducing systemic bias at scale (Salas-Pilco et al., 2022).

A particularly salient concern that emerges consistently across the reviewed literature is the risk that excessive reliance on digital tools may attenuate the development of independent thinking, sustained cognitive focus, and higher-order skills such as critical thinking and creativity (Lubbe et al., 2025). Lubbe et al. (2025) argue that cultivating independent thinkers requires pedagogical approaches that leverage Bloom's taxonomy and critical thinking frameworks in assessment practice, an imperative that sits in productive tension with the automaticity afforded by AI-driven tools. This tension calls for a deliberately calibrated approach to technology integration, one that preserves space for the higher-order cognitive engagement that underpins deep learning.

These challenges are compounded in Global South contexts, where structural barriers, including inadequate technological infrastructure, unreliable connectivity, and insufficient teacher professional development, create significant obstacles to equitable technology integration (Lin & Chang, 2024). Such contextual realities require that technology policies and

frameworks be designed with explicit attention to local conditions, rather than transplanting solutions developed in high-income contexts without critical adaptation. The need for robust ethical frameworks to govern the authentic, rights-respecting use of technology is further underscored by Hadinezhad et al. (2024), who contend that digital competencies should be understood not merely as technical skills but as essential capabilities for educators and future citizens navigating an increasingly algorithmically mediated world.

Methodology

Research Design

This study employed a systematic review design, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework (Page et al., 2021; Tugwell & Tovey, 2021). Systematic review methodology was selected for its capacity to yield reliable, generalisable, and reproducible results through a transparent and rigorously structured process (Siddaway et al., 2019). Unlike narrative reviews, which are susceptible to selection bias and lack methodological transparency, systematic reviews adhere to a pre-specified protocol that encompasses a comprehensive search strategy, explicit inclusion and exclusion criteria, and systematic procedures for data extraction and synthesis. This methodological rigour is essential for producing trustworthy evidence to inform educational policy and practice on a topic as consequential as technology-mediated inclusive education.

Search Strategy and Databases

Two primary databases were systematically searched: the Education Resources Information Center (ERIC) and Google Scholar. ERIC was selected for its comprehensive coverage of education-specific peer-reviewed literature, while Google Scholar was included to broaden the search to interdisciplinary scholarship at the intersection of technology, disability studies, and educational equity. The search was restricted to peer-reviewed articles published between 2023 and 2025, a deliberate choice that reflects the rapid pace of technological development and the consequent need for evidence that accurately represents the current state of research. Key search terms included “technology and inclusive education”, “digital tools and learner diversity”, “artificial intelligence and special educational needs”, “personalised learning and disability”, and “inclusive pedagogy and digital technology”. Boolean operators (AND, OR) were used to maximise search sensitivity.

Inclusion and Exclusion Criteria

Articles were included if they (a) were published in peer-reviewed journals between 2023 and 2025, (b) addressed the intersection of technology and inclusive education in formal educational settings, (c) reported empirical or systematic review findings, and (d) were available as full-text publications in English. Articles were excluded if they (a) focused solely on technology without reference to inclusive education or learner diversity, (b) were published as conference proceedings, book chapters, dissertations, or grey literature, (c) predated 2023, or (d) were not accessible in full text. These criteria were applied independently by the primary researcher and a research assistant, and disagreements were resolved through consensus discussion, thereby enhancing the reliability and credibility of the selection process.

PRISMA 2020 Flow Process

The PRISMA 2020 flow diagram (Table 1) provides a transparent account of the article selection process across four stages: identification, screening, eligibility, and inclusion (Page et al., 2021; Stovold et al., 2014). An initial search yielded 2,597 records from ERIC and Google Scholar. Following the removal of duplicates and records that did not meet the basic inclusion criteria, 609 records remained for screening. Of these, 88 full-text articles were assessed for eligibility, and 73 were subsequently excluded because of irrelevant focus, absence of reference to inclusive education, or contextual mismatch. The remaining 15 articles were included in the qualitative synthesis. This rigorous, multi-stage process ensures that the final corpus of included studies is methodologically sound and directly relevant to the research question.

Table 1
PRISMA 2020 Flow Diagram: Article Selection Process

Stage	**Action**	**n**
Identification	Articles identified via ERIC and Google Scholar	2,597
Screening	Records screened after duplicate removal	609
Eligibility	Full-text articles assessed for eligibility	88
Excluded	Excluded: irrelevant focus, no reference to inclusive education, context mismatch	73
Included	Studies included in qualitative synthesis	15

Table 2
Classification of Included Studies by Research Methodology

Research Methodology	**Number of Studies**
Qualitative	11
Quantitative	3
Mixed methods	1
Total	**15**

Findings and Discussion

Technology as a Catalyst for Inclusive Learning

The preponderance of evidence in the reviewed literature affirms that technology constitutes a powerful catalyst for inclusive education, particularly in its capacity to accommodate learner diversity through personalised, adaptive digital pedagogies (Ahmad et al., 2024; Julien, 2024). The analysed studies converge on the finding that digital technologies are predominantly deployed by educators as differentiated instructional strategies that enhance learner performance, engagement, and motivation, while simultaneously catering for the diverse cognitive, linguistic, and sensory profiles of students in mainstream classrooms. Technology has thus emerged as a pre-eminent vehicle for delivering instructional strategies that promote educational equity and meaningful participation for diverse learners (Gibellini et al., 2023).

The reviewed studies consistently demonstrate that digital tools offer measurable benefits across a range of educational outcomes (Song et al., 2024). Adaptive learning systems have shown promise in providing real-time, differentiated feedback that enables learners to progress at individually appropriate paces, thereby reducing the cognitive and affective barriers that frequently impede the participation of learners with disabilities or learning differences. As

previously noted, such technological competencies function as foundational capacities for educators and future citizens in a digitally mediated society (Hadinezhad et al., 2024). The analysed articles converge with Lin et al. (2024) in affirming that the purposeful integration of technological tools in learning environments has the potential to promote inclusivity and accessibility, rendering the curriculum more navigable for diverse student populations.

Professional Development and Pedagogical Competencies

A critical and recurrent theme across the reviewed literature is the indispensability of structured, sustained professional development in enabling educators to realise technology's inclusive potential. Lin and Chang (2024) identify inadequate teacher training and resource constraints as among the most significant barriers to effective technology integration in Global South contexts. This finding is corroborated by Estrada et al. (2025), whose study of a professional development model for chemistry teachers in secondary education demonstrates that targeted pedagogical training in AI tools can substantively enhance teachers' capacity to design inclusive learning experiences. Such evidence reinforces the argument that technology cannot function as an autonomous agent of inclusion, since its transformative potential is contingent upon the professional agency and pedagogical insight of the educators who deploy it.

The UNESCO AI CFT discussed above (Cukurova & Miao, 2024; UNESCO, 2024) offers teacher education institutions and school systems a structured roadmap for building the pedagogical digital fluency necessary to operationalise inclusive technology practice. Crucially, the framework is designed not merely for technical upskilling but for the cultivation of educators who can critically evaluate the ethical dimensions of technology use and make contextually informed pedagogical decisions. Meaningful human interaction must remain at the centre of the educational experience, so that the pursuit of digital equity does not come at the expense of the relational foundations of effective teaching and learning (Salhab, 2025).

Ethical Considerations and Critical Limitations

While the evidence for technology's benefits in inclusive education is substantial, the reviewed literature also surfaces a set of critical ethical and pedagogical limitations that demand serious policy attention. Concerns regarding algorithmic bias, data privacy, and the accuracy of AI-generated content recur across multiple studies (Hossain et al., 2024; Reina-Parrado et al., 2025; Salas-Pilco et al., 2022). These concerns are particularly acute for marginalised learner populations, whose data are frequently underrepresented in the training sets that underpin adaptive learning systems, thereby risking the systematic amplification of existing educational disadvantage.

Of equal concern is the risk of pedagogical dependency. As discussed above, the reviewed literature consistently identifies over-reliance on digital tools as a potential impediment to the development of independent thinking, critical reasoning, and creative capacity (Lubbe et al., 2025). This finding carries important implications for curriculum design and assessment practice: educators must cultivate a pedagogical approach that harnesses the efficiency and differentiation afforded by digital tools while simultaneously preserving the conditions for deep, self-directed, and cognitively challenging learning. A genuinely inclusive approach to technology integration must resist the temptation of technological solutionism and maintain a clear focus on the educational goals that technology is intended to serve.

The call for robust ethical frameworks governing technology use in education is, therefore, not merely a peripheral recommendation but a central policy imperative. Such frameworks should be co-developed with the full range of educational stakeholders, including students, teachers, school leaders, policymakers, and community representatives, and should be sufficiently flexible to accommodate the diverse contextual realities of different educational settings, particularly those in the Global South, where infrastructural constraints and digital divides remain salient (Lin & Chang, 2024; Pagliara et al., 2024).

PRISMA 2020 as a Methodological Framework for Educational Research

The analysis further reveals a noteworthy methodological trend in the increasing adoption of PRISMA 2020 as a framework for systematic reviews in educational research. Most of the included studies employed qualitative methodologies, with systematic reviews featuring prominently among them, as shown in Table 2. This trend reflects a broader recognition within the educational research community of the need for methodologically rigorous, transparent, and replicable approaches to evidence synthesis on complex, multidimensional topics such as technology in inclusive education. The predominance of qualitative methodologies among the included studies further suggests that researchers are attending not only to the measurable outcomes of technology integration but also to the nuanced, contextually embedded processes through which digital tools are experienced, interpreted, and appropriated by diverse educational actors.

Conclusion

This systematic review has provided a comprehensive and critically grounded account of the benefits and limitations of technology in inclusive education. The synthesised evidence affirms that, when purposefully integrated within theoretically informed pedagogical frameworks such as UDL, digital technologies have a significant capacity to enhance learner engagement, personalise instruction, promote educational equity, and cultivate inclusive learning environments. The findings further demonstrate that educators who deploy digital tools strategically can foster essential soft skills and motivational dispositions in learners that extend beyond the immediate classroom context.

The evidence is, however, equally unambiguous in identifying the conditions under which technology's inclusive potential is realised or frustrated. Professional development, ethical governance, contextual sensitivity, and a sustained commitment to human-centred pedagogy emerge as non-negotiable prerequisites for effective technology integration. The risks of algorithmic bias, data privacy violation, and the erosion of independent thinking capacity are genuine and must be addressed through deliberate policy frameworks and institutional safeguards.

These findings carry urgent implications for educational policy and practice, particularly in the Global South. Governments, curriculum developers, and teacher education institutions must invest in the systemic redesign of educational programmes to align with the needs of all learners in mainstream classrooms, while ensuring that educators are equipped with the digital pedagogical competencies to deploy technology in ways that are ethical, inclusive, and contextually appropriate. As the deadline for the 2030 Sustainable Development Goal 4, which calls for inclusive and equitable quality education for all, draws closer, the imperative to close the gap between technology's transformative promise and its equitable realisation has never been more pressing.

Future research should attend to the experiences of learners themselves in technology-mediated inclusive classrooms, particularly those from marginalised and underrepresented groups whose voices remain largely absent from the current evidence base. Longitudinal studies tracking the sustained impact of technology integration on inclusive educational outcomes are also urgently needed to strengthen the evidence base for policy and practice.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The author declares that no AI or AI-assisted technologies have been used to generate, refine, or correct the content of the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from the careful and systematic conduct of the research.

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