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AI and Inclusive Education in the African Context: Navigating Digital Divide Gaps, Building Equitable Futures

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Abstract

This position paper argues that the rapid, largely uncritical adoption of artificial intelligence (AI) in education, defined here as computational systems capable of language understanding, pattern recognition, and adaptive learning, risks deepening longstanding digital inequities in Sub-Saharan Africa, with disproportionately severe consequences for children with disabilities. Drawing on regional infrastructure data (GSMA, 2024; International Telecommunication Union, 2024), policy analyses (UNESCO, 2023; United Nations, 2024a), and emerging African-led scholarship (Anokwuru et al., 2025; Muchandiona et al., 2025), we demonstrate how uneven access to electricity, broadband, devices, and digital literacy undermines equitable AI integration in inclusive education systems.

AI-enabled tools, including text-to-speech, real-time captioning, adaptive platforms, and multilingual assistive technologies, hold documented potential to support learners with disabilities (Fitas, 2025; Salhab, 2025). However, these benefits remain concentrated in urban, well-resourced contexts. In rural and low-income settings, where infrastructure deficits are most acute (International Energy Agency, 2024; World Bank, 2024), children with disabilities experience compounded exclusion. While

challenges are significant, targeted investments and context-specific adaptations can make the deployment of inclusive AI feasible even in resource-limited settings. Their absence, therefore, constitutes a disproportionate educational harm rather than a shared inconvenience (Mpu, 2023; Muchandiona et al., 2025).

We synthesize current evidence to (a) map how digital infrastructure and AI adoption intersect with disability inclusion across South Africa, Kenya, Ghana, and Nigeria; (b) identify structural gaps in teacher preparation, assistive technology deployment, and culturally responsive AI design; and (c) propose an equity-centered research and policy agenda grounded in participatory, disability-led approaches. The paper calls for coordinated, locally anchored investment to ensure AI narrows, rather than entrenches, educational exclusion.

Keywords: Artificial Intelligence, inclusive education, digital divide, African context, educational equity

1. Introduction

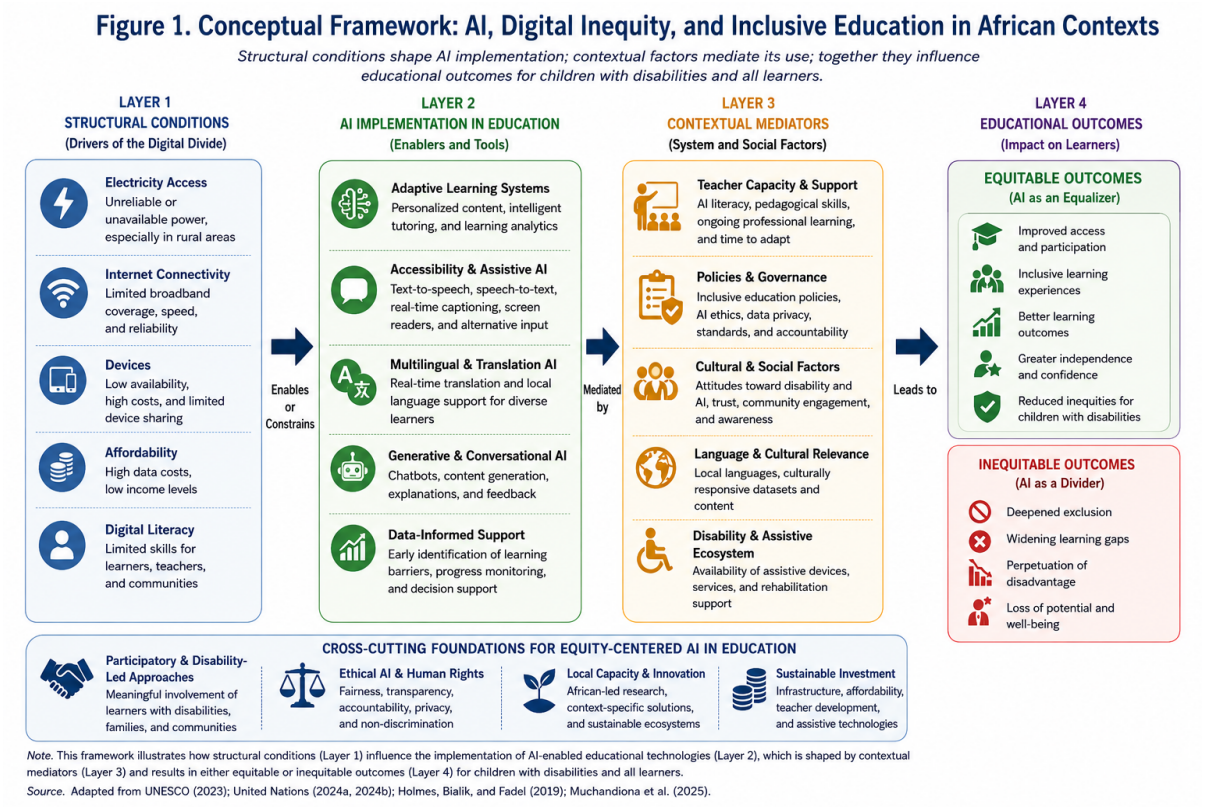
The digital divide describes the gap between population segments in their ability to access, use, and benefit from information and communication technologies (ICTs) (Brookings, 2024; United Nations, 2024a). Artificial Intelligence (AI), understood in this paper as computational systems capable of language understanding, pattern recognition, adaptive learning, and generative content creation, sits at the leading edge of this divide. While AI holds documented potential to transform education through personalized instruction, accessibility tools, and assistive technologies (Fitas, 2025), there is mounting concern that its expansion may deepen existing inequities, particularly for populations already underserved by digital infrastructure.

Throughout this paper, "inclusive education" refers to educational systems that guarantee every child, including those with disabilities and neurodivergent learners, not merely physical placement in mainstream settings, but meaningful access to quality instruction and full participation in school life (Horne-Shuttleworth et al., 2024; UNESCO, 2023). "Children with disabilities" is used in alignment with the United Nations Convention on the Rights of Persons with Disabilities (CRPD), which understands disability as arising from the interaction between individual impairments and environmental and attitudinal barriers (United Nations, 2024b). This social model framing is central to our analysis: barriers to AI-enabled learning are structural and systemic, not inherent to learners themselves.

Although the paper addresses continental patterns, our analysis centers on Sub-Saharan Africa, with illustrative examples drawn from South Africa, Kenya, Ghana, and Nigeria. These four countries were selected because they represent varied levels of digital infrastructure development, policy maturity, and inclusive education implementation (GSMA, 2024; International Telecommunication Union, 2024; World Bank, 2024). This focused lens guards against treating Africa as a homogeneous entity while enabling meaningful cross-country comparison. We draw on three categories of evidence: infrastructure and connectivity data (International Energy Agency, 2024; ITU, 2024; World Bank, 2024) policy and governance reports (UNESCO, 2023; United Nations, 2024a, 2024b) and peer-reviewed scholarship on inclusive education, disability, and AI (Artiles, 2023; Genovesi et al., 2024; Muchandiona et al., 2025). Grounding claims explicitly in these sources allows us to distinguish evidence-based analysis from speculative narratives surrounding AI in education.
In Africa, the digital divide is both long-standing and multidimensional. Only about 38% of the continent's population is online, far below the global average of 68% (Ecofin, 2025; United Nations, 2024a). Mobile broadband is expanding, but reliability, cost, electricity supply, device availability, and digital skills remain deeply uneven especially in rural, remote, and low-income communities. Women and girls, people with disabilities, and rural populations face the sharpest disadvantages (Africa Renewal, 2024; Brookings, 2024).

Within this context, children with disabilities encounter compounded barriers (Anokwuru et al., 2025). Inclusive education policies across much of Africa remain under-resourced and weakly implemented, with chronic shortfalls in teacher training, assistive technology, and institutional support (Genovesi et al., 2024). When AI-enabled tools are deployed, they tend to reach urban, better-resourced schools first, raising the prospect that AI, rather than closing inclusion gaps, may entrench them further.

This paper positions children with disabilities at the center of analysis and is organized as follows. Section 2 maps the current state of digital access and infrastructure across the four focus countries. Section 3 examines AI's potential and risks for inclusive education. Section 4 addresses teacher education, research equity, and knowledge production. Section 5 analyzes assistive technology adoption and cultural barriers. Section 6 proposes a coordinated equity-centered agenda for policy, practice, and research. Across all sections, this paper pursues three aims: to map how digital infrastructure and AI adoption intersect with disability inclusion; to identify structural gaps in teacher preparation, assistive technology, and AI design; and to ask, ultimately, who is served by AI in African education and who is being left behind. Figure 1 below visually presents the conceptual framework guiding this paper.



Note. This framework illustrates how structural conditions (Layer 1) influence the implementation of AI-enabled educational technologies (Layer 2), which is shaped by contextual mediators (Layer 3) and results in either equitable or inequitable outcomes (Layer 4) for children with disabilities and all learners.

Source. Adapted from UNESCO (2023); United Nations (2024a, 2024b); Holmes, Bialik, and Fadel (2019); Muchandiona et al. (2025).

Note. In figure 1, this framework illustrates how structural conditions influence the implementation of AI-enabled educational technologies (AIEd), which are mediated by contextual enablers, barriers, and intersecting inequities to produce either equitable or inequitable educational outcomes for children with disabilities and neurodivergent learners in Sub-Saharan African contexts (see Figure 1).

2. Current Reality of the Digital Divide in Africa

Access to Devices and Connectivity

Despite rapid growth in mobile technology, Africa continues to experience wide digital disparities, particularly in access to devices and internet services. Internet penetration remains significantly lower

than the global average, with only about 36% of individuals in Africa using the internet as of 2023, compared to 67% globally (International Telecommunication Union, 2024). Access is uneven across and within countries. South Africa, for example, has an internet penetration rate exceeding 70%, reflecting greater investment in infrastructure and device ownership, whereas Nigeria and Kenya average around 55–60%, and Ghana remains closer to 50% (GSMA, 2024; ITU, 2024). Affordability also remains a structural barrier. Mobile data costs in many African countries exceed the global affordability benchmark, which defines 1GB of data as affordable if it costs no more than 2% of average monthly income (Alliance for Affordable Internet, 2022; Ecofin Agency, 2025). In Nigeria and Ghana, the cost of 1GB of data often exceeds this threshold, limiting consistent use. At the same time, South Africa and Kenya remain closer to the benchmark but still face affordability gaps for low-income populations (GSMA, 2024). As a result, smartphone ownership remains uneven, and many households rely on shared, basic-feature devices, further widening the digital participation divide, especially in rural areas (ITU, 2024).

Although continental statistics provide a macro-level overview (ITU, 2024), the disparities become clearer when examining country-level contrasts. Across South Africa, Kenya, Ghana, and Nigeria, variations in electricity reliability, broadband penetration, and data affordability produce markedly different conditions for the implementation of educational AI (GSMA, 2024; World Bank, 2024). These infrastructural differences matter particularly for learners with disabilities, who depend more heavily on AI-enabled tools to access the curriculum, a point developed further in Section 3.

Infrastructure Challenges

Infrastructure limitations further constrain digital access across the continent. Consistent electricity is foundational for digital participation, yet millions remain without reliable power. South Africa has near-universal electricity access but experiences chronic load shedding and grid instability. Kenya has expanded access to roughly 75% of households, and Ghana has surpassed 80%, though rural electrification remains inconsistent in both countries (World Bank, 2024). Nigeria faces the most severe energy barrier among the four, with less than 60% of the population having access to electricity and frequent outages that force reliance on costly generators (International Energy Agency, 2024). Broadband infrastructure mirrors this inequality. South Africa has the most advanced network and the highest 4G/5G availability; Kenya is rapidly expanding mobile broadband through its innovation economy; Ghana is building capacity more gradually; and Nigeria, despite a large technology market, struggles with coverage reliability and high data costs (GSMA, 2024). These structural gaps in electricity, broadband, and network reliability limit not only individual connectivity but also the scalability of national digital programs and, critically, the assistive-technology initiatives that children with disabilities depend upon.

Social-Cultural and Policy Barriers for Persons with Disabilities

For people with disabilities, the digital divide is compounded by socio-cultural, educational, and policy constraints. Weak enforcement of accessibility policies, pervasive stigma toward disability, and low digital literacy combine to restrict equitable access to technology (Akhter et al., 2025; United Nations, 2024b). Across the four focus countries, disability advocacy movements are growing, but national accessibility regulations remain unevenly implemented. Kenya and South Africa have stronger legal frameworks, yet accessible content and assistive-technology adoption still lag well behind need (UNESCO, 2024). In Nigeria and Ghana, cultural stigma and limited institutional support further restrict access to training, affordable devices, and inclusive design (United Nations, 2024b). Because accessible hardware, software, and assistive technologies remain expensive and scarce, individuals with disabilities are significantly less likely to use mobile internet or benefit from digital learning platforms (GSMA, 2024). Closing this gap requires not only infrastructure investment but also the active

implementation of disability-inclusive policies, targeted subsidies for assistive technologies, investments in local capacity, and the meaningful involvement of persons with disabilities in decision-making processes (GSMA, 2024; United Nations, 2024b). These barriers are not merely technical. They reflect deeper patterns of exclusion that AI adoption, if unmediated, risks reproducing at scale. The following sections examine both AI's potential to disrupt this cycle and the structural conditions that determine whether that potential is realized.

3. AI and Inclusive Education: Opportunities and Risks

Inclusive Education and AI's Potential

The promise of AI for inclusive education lies in its capacity to align with Universal Design for Learning (UDL) principles, offering multiple pathways for engagement, representation, and expression. Critically, AI is not simply a more efficient version of general educational technology (EdTech). Unlike conventional digital tools such as presentation software or online learning management systems; AI-specific educational tools (AIEd) are distinguished by their capacity for real-time adaptation, natural language processing, and personalized response generation (Holmes et al., 2019). Text-to-speech, real-time captioning, AI-generated braille, and adaptive learning platforms are AIEd tools with particular relevance to learners with disabilities; they can open qualitatively new opportunities for participation, but only if devices are affordable, platforms are localized, and teachers are prepared to integrate them meaningfully (UNESCO, 2024). Effective inclusive education involves more than the physical placement of students in mainstream settings; it also requires their access to quality instruction and full participation in school experiences (Horne-Shuttleworth et al., 2024). From a social-model perspective, the challenge is not whether children with disabilities can adapt to AI, but whether AI systems and educational policies can be redesigned to fit them.

Pilot projects in South Africa and Kenya demonstrate that AI-enabled tools can meaningfully enhance the participation of children with disabilities (UNESCO, 2023). However, the limited reach of such programs reflects structural inequities rather than inherent limitations of the technology. Taken together, UNESCO (2023), Fitas (2025), and Salhab (2025) collectively demonstrate AI's technical potential to support accessibility, but infrastructure data from ITU (2024) and GSMA (2024) make clear that these benefits depend on stable connectivity and device access. Without those preconditions, AI-enabled inclusion remains aspirational. The divergence between technological promise and infrastructural reality underscores the central argument of this paper: AI's impact on inclusive education is structurally mediated rather than technologically predetermined.

Personalized Learning and Adaptive Technologies

In inclusive educational settings, educators are expected to manage curriculum design, pedagogical instruction, formative feedback, and the scholarship of learning simultaneously. Assessing diverse student needs is increasingly complex, given variation in learning styles, prior knowledge, cultural backgrounds, and emotional readiness. AI, as defined in this paper, meaning computational systems capable of language understanding, pattern recognition, and adaptive learning; is positioned to address these challenges in ways that general EdTech cannot (Mohammed & Watson, 2019). It is important to distinguish, however, between AI-driven educational tools and the broader EdTech category. Not all digital tools used in education are AI-based: platforms such as Kahoot, Gimkit, or iClicker are valuable EdTech tools for engagement and assessment, but they do not qualify as AIEd because they do not adapt in real time to individual learner profiles (Holmes et al., 2019). By contrast, tools such as JAWS, Kurzweil 3000, Immersive Reader, Read and Write Gold, Goblin Tools, and AI-powered predictive text platforms qualify as AIEd because they employ machine learning to personalize the user experience, and for learners with visual, language-processing, or cognitive

disabilities, they function as essential gateways to curriculum access rather than optional enhancements.

Figure 2. General EdTech vs. AI-Driven Educational Technology (AIEd)

Distinct characteristics, functions, and examples relevant to inclusive education in African contexts

DIMENSION	GENERAL EDUCATIONAL TECHNOLOGY (EDTECH) Rule-based / Human-operated / Static	AI-DRIVEN EDUCATIONAL TECHNOLOGY (AIEd) Data-informed / Adaptive / Intelligent
Technology Nature	**Static tools and platforms** Deliver the same content and functions to all users.	**Adaptive and intelligent systems** Use algorithms and data to learn from users and adjust in real time.
Personalization	**Limited or no personalization** One-size-fits-all content; users must adapt to the system.	**High personalization** Tailors content, pace, and supports to individual learning profiles and needs.
Learning Support	**General support tools** Provide resources (e.g., videos, worksheets) but do not adapt to learner performance.	**Intelligent learning support** Provides adaptive feedback, hints, scaffolding, and predictive interventions.
Data Use	**Minimal data use** Tracks basic usage or completion (e.g., logins, time).	**Advanced data analytics** Analyzes patterns, predicts challenges, and informs instructional decisions.
Accessibility Potential	**Accessibility by design (if included)** Features are fixed; updates require human redesign.	**Dynamic and inclusive accessibility** AI enables real-time adjustments (e.g., text-to-speech, auto-captioning, language translation).
Examples	• Google Classroom (LMS) • Kahoot! • PowerPoint • YouTube	• Immersive Reader (Microsoft) • Goblin Tools • ChatGPT (educational use) • Text-to-Speech & Real-Time Captioning Tools
Decision-Making	**Human-driven** Teachers and learners make all decisions based on available information.	**Human-AI partnership** AI informs and recommends; humans make final pedagogical decisions.
Offline / Low Connectivity	**Often functional offline** Many tools work with low or no internet.	**Often requires connectivity (but evolving)** Many AI tools need data/cloud access; offline AI models are emerging.
Key Takeaway	While general EdTech delivers content and facilitates instruction, AI-driven educational technologies (AIEd) learn from data to personalize, accommodate, and empower learners—offering powerful potential to advance inclusion for children with disabilities in African contexts when equitably implemented.	

Note. Figure 2 distinguishes general educational technology (EdTech) from AI-driven educational technology (AIEd) across key dimensions; including personalization, accessibility, language responsiveness, and adaptive features highlighting the particular significance of AIEd for inclusive education and learners with disabilities and neurodivergent learners in Sub-Saharan African contexts (see Figure 2).

Salhab (2025) argues that leveraging AIEd in inclusive education can promote universal accessibility for all learners, with particular benefits for those from marginalized communities. Aguilar et al. (2021) further suggest that integrating AI into educational platforms enhances personalized learning, increases accessibility, and helps overcome barriers for diverse students. Inclusive education in the Global South, however, faces significant structural challenges, including insufficient funding, a lack of institutional recognition, and difficulties in equitably addressing individual learning needs (Artiles, 2023; Uthus & Qvortrup, 2024). Overcoming these challenges requires substantial investment from governments and public-private partnerships (Anokwuru, 2023). However, Zabeli and Gjelaj (2020) observe that many educators currently lack the competencies needed to integrate AI into inclusive classroom practice. Professional development must therefore go beyond basic digital skills to encompass hands-on experience with AIEd tools, an understanding of their limitations and biases, and the pedagogical knowledge to deploy them in ways that genuinely serve learners with disabilities. Zhang and Zhang (2024) confirm that where such preparation exists, AI positively influences teaching through enhanced classroom management, personalized strategies, enriched digital learning, and stronger social relationships among students.

Risk and Inequities

AI also poses significant risks, especially in under-resourced contexts. Privacy is a primary concern: AI-enabled tools extensively access and process learner data, and implementing adequate safeguards encryption, secure storage, regulated data collection, and compliance with student data protection

standards requires investment that many African schools cannot sustain. This creates conditions in which students, particularly those with disabilities whose use of assistive tools generates additional data, may be exposed to exploitation or misuse. Chitiyo et al. (2024) emphasize the need for teacher education curricula that explicitly address these risks, equipping educators to advocate for learners rather than simply operate the tools.

Cultural and algorithmic bias present an equally serious concern. AI systems are trained on large datasets that reflect the priorities and perspectives of their creators, who are predominantly located in the Global North. In African and Global South contexts, this means that datasets may perpetuate biases related to skin color, language, and cultural norms, resulting in the marginalization of learners with diverse needs (Smith & Oladipo, 2024). For neurodivergent learners; including those with autism, ADHD, dyslexia, or dyscalculia, this risk is compounded: tools calibrated for neurotypical, English-speaking users may misread their responses, misclassify their needs, or generate content that is inaccessible to them. Professional development initiatives must therefore cultivate not only technical competence but also the critical awareness to identify, question, and challenge these embedded biases (Smith & Oladipo, 2024).

Implications for Children with Disabilities

In digitally equipped, well-resourced urban schools, learners with disabilities may, in some cases, benefit disproportionately from AIEd tools when they are the primary recipients of assistive technologies. AI-enabled captioning, screen readers, predictive text, and adaptive platforms can significantly enhance participation and align with UDL principles where infrastructure and trained educators are in place (Fitas, 2025; UNESCO, 2023; Zhang & Zhang, 2024).

However, such contexts are the exception rather than the norm across Sub-Saharan Africa. Reliable internet, electricity, and device access remain unevenly distributed (ITU, 2024; World Bank, 2024). For learners without disabilities, the absence of AI tools may represent a missed opportunity for enrichment. For learners with disabilities, it is categorically different: as Mpu (2023) notes, assistive technologies frequently serve as gateways rather than enhancements, providing the basic access to curriculum that nondisabled peers obtain without technological mediation. When those gateways are absent, educational exclusion is magnified rather than equalized. Muchandiona et al. (2025) illustrate this dynamic among visually impaired learners, where AI-enabled tools could provide access to reading materials but remain inaccessible due to cost and infrastructure constraints.

The impact of digital inequity is therefore not symmetrical. Learners with disabilities often experience a "double digital divide": first, unequal access to general connectivity; and second, limited availability of accessible, localized assistive technologies. This distinction clarifies why the absence of AI constitutes a proportionally greater educational disruption for children with disabilities than for their nondisabled peers and why equity arguments for AI investment are especially urgent in this population. This asymmetry threads through every subsequent section of the paper.

Impact on Learning Outcomes, Participation, and Equity

Rural–urban disparities further deepen these inequities. Students in rural areas face compounded disadvantages, including limited connectivity, limited access to devices, and restricted exposure to digital technologies. Mwansa et al. (2025) found that more than half of respondents in rural South Africa lacked reliable internet access, citing affordability as the primary barrier. In Ghana, rural households report significantly lower internet access than urban centers, limiting students' participation in digital learning (Opoku et al., 2017). In Nigeria, unreliable electricity and high data costs continue to marginalize rural communities despite steady urban infrastructure growth (Adebayo et al., 2021). Tanzania faces comparable challenges, with rural schools frequently lacking reliable internet and trained personnel to

integrate AI tools into instruction (Mtega et al., 2018). Urban students in these countries, by contrast, generally have greater access to infrastructure and resources, widening the gap in digital literacy and participation. These rural–urban patterns illustrate how AI-driven educational initiatives often reinforce rather than reduce preexisting inequalities.

Intersectionality

Gender adds another critical dimension. Female learners, particularly in rural and low-resource contexts, often face limited access to shared devices, lower confidence in engaging with technology, and increased domestic responsibilities that constrain their study time, resulting in fewer opportunities to benefit from AI-enabled platforms (Constancio et al., 2025). Socioeconomic status compounds this: learners from lower-income households are less able to afford devices, pay for data, or maintain stable electricity access, and even when AI-based programs are theoretically available, high connectivity costs exclude the most economically disadvantaged students (Miah, 2024).

Persons with disabilities, and neurodivergent learners in particular, experience the most severe exclusion. Zongozzi et al. (2025) found that many higher education programs intending to include students with disabilities fail to provide adequate accommodations or accessible platforms. Buthelezi (2024) similarly reported that people with disabilities in KwaZulu-Natal faced marginalization in digital access, often having limited or no access to necessary technology. Even when devices or AI applications exist, they are frequently inaccessible: voice assistants may not recognize local languages; user interfaces may be poorly designed for users with motor or cognitive impairments; and training opportunities are scarce. For neurodivergent learners specifically, the situation is worsened by the absence of culturally adapted tools that account for diverse cognitive profiles; a gap that AI, properly designed, is uniquely positioned to address through adaptive and personalized learning features (Holmes et al., 2019).

Taken together, these intersecting factors; rural residence, gendered constraints, socioeconomic inequality, disability, and neurodivergence demonstrate that digital inequity in Africa is not a single-issue problem but a complex web of overlapping disadvantages. A rural female student with dyslexia and limited economic means, for example, encounters multiple simultaneous barriers: she may lack affordable internet, find that available AI tools do not support her mother tongue, and face societal expectations that limit her study time. Without intentional, intersectional strategies, AI and digital education risk perpetuating the very inequities they claim to resolve.

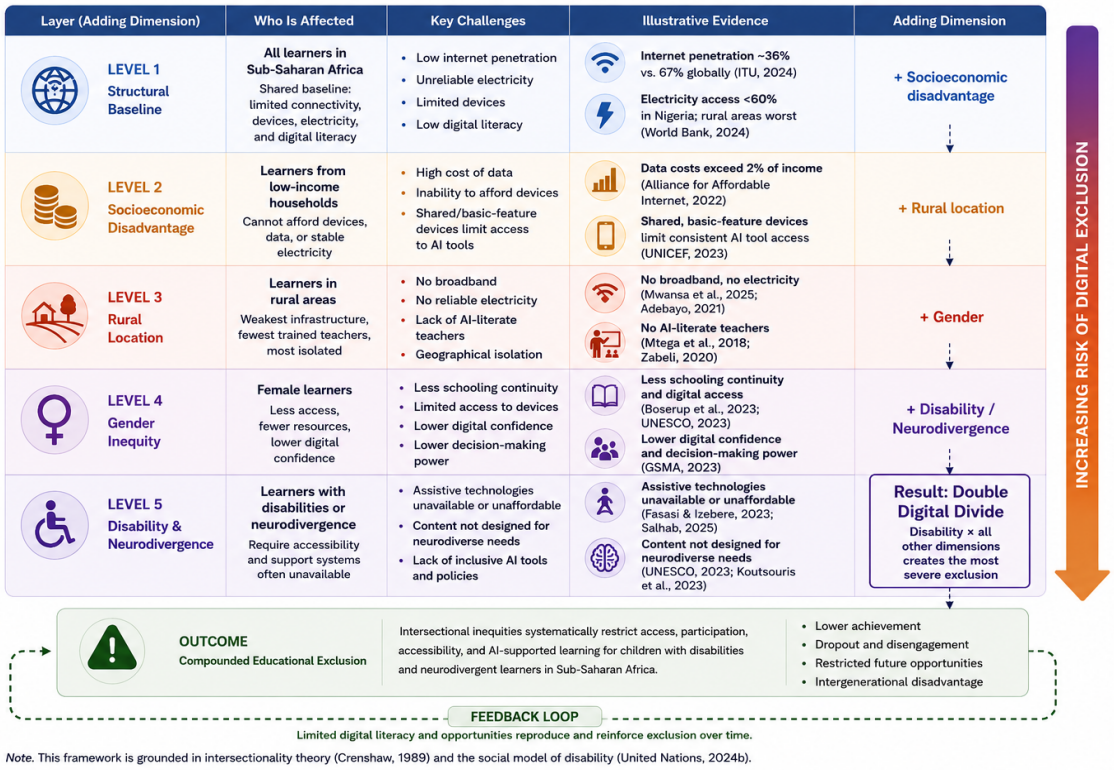
Note. Grounded in intersectionality theory (Crenshaw, 1989) and the social model of disability, figure 3 illustrates how overlapping dimensions of inequity including poverty, rurality, gender, disability, and neurodivergence do not operate independently but interact to compound barriers to AI-enabled learning and educational participation for children with disabilities and neurodivergent learners in Sub-Saharan African contexts (see Figure 3).

4. Implications for Teacher Education and Research

The rapid integration of AI into education in Africa brings both opportunities and challenges for teacher preparation and research. AI-enabled tools have the potential to be transformatively inclusive, but they require educators to possess both technical and critical pedagogical competencies. Gaps in teacher education, research infrastructure, and knowledge systems currently threaten to undermine AI's capacity to support children with disabilities and neurodivergent learners.

Figure 3. Intersectionality and Compounded Digital Exclusion

Each additional dimension intensifies barriers to AI-enabled learning in Sub-Saharan Africa



Note. This framework is grounded in intersectionality theory (Crenshaw, 1989) and the social model of disability (United Nations, 2024b).

Teacher Education: Addressing Digital and AI Literacy Gaps

Myrie et al. (2024) emphasized that effective teacher education programs are critical for preparing educators with the theoretical knowledge and practical skills needed to meet diverse student needs. A significant challenge for inclusive education in Africa is the limited integration of AI and digital literacy into pre-service and in-service training. As Zabeli and Gjelaj (2020) observe, many educators lack the competencies needed to effectively incorporate AI into inclusive classrooms for students with diverse abilities. This is compounded by the understanding that inclusive education requires not merely placing students with disabilities or neurodivergent learners in mainstream settings, but ensuring their access to high-quality instruction and meaningful participation in all aspects of school life (Horne-Shuttleworth et al., 2024).

Educators need more than foundational digital skills. Professional development must build expertise in AIEd tools specifically relevant to inclusive practice: speech-to-text and text-to-speech applications, semantic and image recognition, real-time captioning, adaptive platforms, and AI-powered tools such as JAWS, Kurzweil 3000, Immersive Reader, Read and Write Gold, Goblin Tools, and braille translators. These are not general EdTech tools; they are AI-driven systems that require specific training to deploy effectively for learners with visual, auditory, language-processing, and cognitive disabilities; including neurodivergent learners who may benefit from personalized pacing, reduced cognitive load, and multimodal content delivery. However, such tools are rarely integrated into teacher training programs in Africa.

Chitiyo et al. (2024) advocate for systemic reform to integrate AI literacy and UDL principles from the outset of teacher education. Zhang and Zhang (2024) confirm AI's positive impact on teaching, where preparation is adequate. To realize these benefits, teachers must be equipped not only to use AI tools but to critically evaluate them for bias, cultural relevance, and accessibility. Curricula should incorporate the social and ethical dimensions of AI, including data privacy, algorithmic bias, and the

particular vulnerabilities of learners with disabilities (Smith & Oladipo, 2024). Resource limitations complicate these efforts: in under-resourced environments, sustaining continuous professional development on evolving technologies is a significant barrier (Genovesi et al., 2024). This reinforces the case for investment in teacher capacity as a foundational, rather than supplementary, element of inclusive AI deployment.

Educational Research: Strengthening African-Led Scholarship

A parallel challenge exists in educational research. Limited African-led scholarship on AI, disability, and inclusion constrains knowledge production and weakens the policy evidence base. Most research originates from high-income countries with assumptions and priorities that do not always align with African contexts (Artiles, 2023), leaving local educators and policymakers reliant on externally designed tools and frameworks. African universities and research institutions frequently lack the funding, infrastructure, and access to datasets necessary to conduct rigorous studies on AI and disability inclusion (UNESCO, 2024). Without relevant local evidence, policymakers may implement AI strategies that are contextually inappropriate, and educators may lack actionable guidance on adapting global tools to local needs.

Pilot projects in South Africa and Kenya illustrate AI's potential to improve participation for children with disabilities (UNESCO, 2023). However, their limited scale reflects broader structural inequities rather than AI's inherent limitations. Expanding the regional evidence base through African-led research is therefore not an academic aspiration but a practical prerequisite for scaling effective interventions and avoiding the harms of poorly adapted solutions.

Knowledge Production Inequities: Dependence on Global North Frameworks

The dependence on Global North-produced tools and frameworks represents a structural inequity in knowledge production with direct implications for learners with disabilities. This dependence manifests in reliance on proprietary AI systems developed by multinational corporations, the adoption of pedagogical frameworks designed for high-resource contexts, and the implementation of accessibility standards that do not adequately reflect African linguistic and cultural diversity.

Language is where this inequity is most starkly visible. Digital tools are overwhelmingly designed for English, French, or Portuguese, reflecting the enduring legacies of colonialism and global market forces. This excludes learners whose mother tongues are among Africa's 2,000 languages (Masakhane, 2023). AI trained predominantly on high-resource languages performs poorly in African linguistic contexts: voice assistants fail to recognize local accents, translation tools produce inaccurate output, and text-to-speech applications mispronounce or omit key words (Muchandiona et al., 2025). For children with disabilities and particularly for neurodivergent learners who may depend on consistent, accurate auditory or textual support; linguistic exclusion adds a further barrier that can effectively deny participation in AI-enhanced learning. A screen reader that cannot render Swahili, Yoruba, or Zulu is simply non-functional for a blind student in Kenya, Nigeria, or South Africa. Real-time captioning trained only on standardized English also fails in multilingual classrooms where code-switching and local dialects are the norm (Fitas, 2025).

The Masakhane NLP project offers an important counter-model. This Pan-African initiative is building AI tools; including offline-capable translation and speech technologies for nearly 50 African languages, developed by African researchers using African data (Masakhane, 2023). Masakhane's approach demonstrates that, with appropriate investment in local expertise and collaborative infrastructure, Africa can generate AI tools that are linguistically accurate, culturally relevant, and accessible to learners with disabilities, without reliance on expensive proprietary licenses. Beyond language, the dependence on Global North frameworks extends to pedagogical approaches and research

methodologies. UDL, for instance, was primarily developed in North American contexts; its application in Africa requires critical adaptation for different resource levels, cultural values, and educational priorities (Mohammed & Watson, 2019). Research methodologies that privilege quantitative measures and individual outcomes may also overlook the collective, community-oriented approaches that characterize many African educational contexts (Anokwuru et al., 2025). Addressing knowledge production inequities, therefore, requires not only improved access to tools but recognition of epistemic justice; the principle that knowledge generated in and from African contexts is equally valid and valuable.

Role of Researchers: Participatory Approaches and Local Engagement

Addressing these challenges requires a fundamental shift in how AI and disability research are designed and conducted. Disability-led organizations must be at the center of these processes. Persons with disabilities possess first-hand knowledge of the barriers they encounter and the accommodations they require, making their insights essential for designing genuinely inclusive AI systems (United Nations, 2024b). However, disability advocacy in many African countries remains marginalized, with limited influence on policy or resource allocation (UNESCO, 2024). Strengthening these organizations' institutional capacity and ensuring their active participation in education planning, technology governance, and AI research and development are prerequisites for equity, not optional enhancements.

Participatory research approaches position persons with disabilities, educators, and community members as co-investigators and knowledge producers rather than research subjects. This aligns with the social model of disability, which attributes exclusion to environmental and systemic barriers rather than individual deficits (Muchandiona et al., 2025). Research conducted with rather than on communities is more likely to generate actionable insights, build local capacity, and produce sustainable change. Community involvement should encompass teachers, parents, and caregivers, who are the primary users and mediators of AI tools in schools (Chitiyo et al., 2024; Zabeli & Gjelaj, 2020).

Cross-sector collaboration is equally essential. Initiatives such as the GDI Hub roundtables, the Equitable AI Alliance, and Global Alliance Africa's UK-Africa innovation partnership each demonstrate that meaningful change requires coordination across sectors, anchored in the lived expertise of those most affected (Global Disability Innovation Hub, 2024). The African Union's Continental AI Strategy and UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021) provide continental and global ethical frameworks that must inform all AI research, procurement, and deployment decisions affecting persons with disabilities. Strathmore University's CIPIT research similarly identifies policy safeguards and representative datasets as non-negotiable prerequisites for equitable AI adoption in Africa (Kaaniru, 2023). Researchers must engage these frameworks actively, providing evidence, facilitating stakeholder dialogue, and amplifying the voices of marginalized communities in policy processes.

5. Assistive Technology and the African Context

AI-enabled assistive technologies (AT) are transforming inclusive education globally. In Africa, however, contextual barriers mean that this transformation remains largely unrealized. Fitas (2025) identifies the key enablers; internet access, translation support, hardware, teacher training, and cultural and ethical assurance, as consistently absent in rural and under-resourced institutions, precisely where the majority of children with disabilities in Sub-Saharan Africa are educated.

Several factors compound this gap. Cost is the most frequently cited barrier: the majority of AI-enabled AT tools are imported and priced far beyond the budgets of schools and households (Abdelwahab et al., 2025). Infrastructure deficits; particularly unreliable electricity, prevent schools from

consistently powering and maintaining these technologies. Perhaps most insidiously, stigmatization of disability leads many communities to view investment in assistive tools as wasteful, deprioritizing already-scarce resources (Goyal, 2025; Muchandiona et al., 2025; Ndibalema & Kambona, 2023). While high-income countries are rapidly integrating AI into disability strategies and inclusive education frameworks, African nations are still constructing the foundational policy and infrastructure conditions for such integration (Shafik, 2025).

Locally adaptable, low-cost, and open-source innovations offer a viable pathway forward. AI tools developed in local languages can provide scalable alternatives that circumvent licensing costs and reduce language exclusion (Muchandiona et al., 2025). Offline-capable applications such as text-to-speech tools that function without internet connectivity are especially valuable in rural areas. The Masakhane NLP project exemplifies this approach: its offline-ready translation and speech technologies, developed by African researchers using African language data, support learners with visual and language-processing disabilities while simultaneously building local AI literacy capacity (Masakhane, 2023). Community-driven solutions have demonstrated that with creative adaptation and genuine community ownership, AI-enabled assistive technologies can be made both affordable and contextually appropriate. Scaling these approaches requires policy environments that support grassroots innovation, funding mechanisms that prioritize local capacity-building over imported solutions, and governance frameworks ensuring communities retain meaningful control over the tools that shape their children's education.

6. Cultural and Societal Considerations

Attitudes Toward Disability and Technology Adoption

Cultural attitudes toward disability significantly shape the adoption and effectiveness of AI-enabled assistive technologies in African education. The dominant cultural framework in many communities remains a deficit-oriented medical model that frames disability as an individual impairment to be managed, rather than a social model that locates exclusion in environmental and systemic barriers (Muchandiona et al., 2025). Deep-seated stigma frames disability as shameful or as a form of divine punishment, prompting some families to conceal children with disabilities or limit expectations for their education (Anokwuru et al., 2023; Ndibalema & Kambona, 2023). Such beliefs directly affect resource allocation: where disability is treated as a fixed condition, investment in assistive technologies is readily dismissed as wasteful (Goyal, 2025).

This stigmatization creates a self-reinforcing cycle of exclusion. Schools with constrained budgets deprioritize AI-enabled assistive devices, often justifying this by arguing there are too few learners with disabilities to merit the expense (Muchandiona et al., 2025). Teachers who hold ableist assumptions may doubt the educability of students with disabilities and perceive technology as a superficial substitute for genuine inclusion rather than a meaningful pathway to participation (Chitiyo et al., 2024). Parents and caregivers facing economic hardship and social pressure may hesitate to advocate for accommodations. Even where assistive technologies are available in principle, these attitudinal barriers frequently prevent their meaningful integration into practice.

Shifting these attitudes requires intentional, sustained engagement at multiple levels. Disability awareness campaigns must center the voices and lived experiences of persons with disabilities to challenge stereotypes and demonstrate the transformative potential of practical technological support (United Nations, 2024a). Teacher education programs must explicitly address attitudinal barriers, equipping educators with both technical skills and a commitment to inclusive pedagogy grounded in human rights (Zabeli & Gjelaj, 2020). Community dialogues involving disability-led organizations, religious leaders, traditional authorities, and local influencers can foster cultural shifts from the ground up. The goal is to reframe disability and neurodivergence as natural dimensions of human diversity

rather than deficits to be hidden or overcome (UNESCO, 2024). Where these foundational attitudes remain unaddressed, AI and assistive technologies will continue to be underutilized regardless of their technical sophistication.

The Role of Local Languages and Cultural Knowledge in AI-Driven Tools

Language is a critical and often overlooked dimension of equitable AI in African education. As noted in Section 4, English, French, and Portuguese dominate digital platforms, creating barriers for learners whose mother tongues are among Africa's 2,000 languages (Masakhane, 2023). This challenge is especially severe for neurodivergent learners and those with visual, auditory, or language-processing disabilities, who frequently rely on AI tools to access information. A screen reader that cannot render Swahili, Yoruba, or Zulu is non-functional for a blind student in Kenya, Nigeria, or South Africa; real-time captioning trained only on standardized English fails in multilingual classrooms where code-switching is routine (Fitas, 2025; Muchandiona et al., 2025). These shortcomings are not inevitable, they result from design choices that systematically favor dominant languages and ignore the linguistic realities of the Global South.

The Masakhane project demonstrates a viable alternative: by prioritizing African researchers, data, and languages, it has produced translation and speech tools that are accurate and tailored to local needs, accessible to learners with disabilities, and openly licensed for use in under-resourced schools and communities (Masakhane, 2023; Muchandiona et al., 2025). Beyond language, cultural knowledge must inform the design and deployment of AI tools more broadly. Educational AI that generates only Western examples may alienate learners, reduce engagement, and damage learning outcomes. AI-driven assessment that assumes universal cultural competencies may misclassify students' learning profiles; including neurodivergent students whose cognitive styles differ from the norms embedded in training data (Fitas, 2025). Addressing these risks requires participatory design from the outset: local educators, learners, families, and disability advocates must help shape AI systems so that cultural knowledge is incorporated by design rather than retrofitted later.

Community Involvement in Shaping AI Use in Education

Genuine community involvement is essential for AI-driven educational tools to support children with disabilities and neurodivergent learners effectively. Top-down technology deployments in which external actors impose systems without consulting end users, have consistently failed to achieve lasting adoption or equity in African educational contexts (Shafik, 2025). Participatory approaches, by contrast, foster ownership, build local capacity, and increase the likelihood that AI tools will meet genuine needs (UNESCO, 2024). Disability-led organizations must anchor these processes. Persons with disabilities possess indispensable first-hand knowledge of the barriers they encounter and the accommodations they require, and their participation in education planning, technology governance, and AI research and development is non-negotiable for equity (Goyal, 2025; United Nations, 2024b).

Community involvement must also encompass teachers, parents, and caregivers as active co-designers rather than passive recipients. Professional development should provide opportunities for teachers to explore AI technologies together, share practical experience, and collaborate on problem-solving (Chitiyo et al., 2024). Parents and caregivers of children with disabilities need accessible information about available assistive technologies, hands-on training in their use, and forums through which to advocate effectively for their children within the education system (Zabeli & Gjelaj, 2020). Community-driven innovations; including low-cost assistive devices built from locally available materials and open-source AI applications adapted for regional languages demonstrate what becomes possible when communities are empowered to shape their own technological futures (Masakhane, 2023; Muchandiona et al., 2025). Scaling these models requires policy environments that recognize and fund grassroots innovation, governance structures ensuring communities retain meaningful control over the

AI tools affecting their lives, and national strategies that position local community knowledge as a resource rather than an obstacle (Shafik, 2025).

7. Toward Equity: A Call to Action

The transformation of African education through AI requires comprehensive, coordinated action across policy, practice, and research. Drawing on the evidence presented throughout this paper, we propose actionable recommendations structured to ensure that AI narrows rather than widens educational exclusion for children with disabilities and neurodivergent learners.

Policy Recommendations

Infrastructure Investment and Digital Access: Governments, international organisations, and private-sector partners must prioritise foundational infrastructure investments, including: (a) reliable, affordable internet access to rural and underserved areas, with subsidised data plans meeting the 2% affordability benchmark; (b) consistent electricity through grid expansion, renewable energy, and backup systems for schools; (c) national programmes providing low-cost, durable devices and AI-enabled assistive technologies with maintenance support; and (d) mandatory accessibility requirements, including multilingual support and UDL adherence in all government-procured AI educational tools.

Inclusive AI Governance Frameworks: AI governance must centre disability rights, ethical safeguards, and participatory decision-making through: (a) meaningful involvement of persons with disabilities including neurodivergent individuals in policy design, implementation, and monitoring; (b) robust data protection regulations requiring informed consent, transparency, and regular algorithmic bias audits; (c) national AI ethics guidelines informed by the African Union's Continental AI Strategy and UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021), addressing bias, cultural representation, and accountability; and (d) inter-ministerial task forces aligning AI investments across education, ICT, disability affairs, and finance ministries.

Disability-Inclusive National Strategies: National development plans must explicitly integrate disability and neurodiversity inclusion by: (a) embedding accessibility requirements in ICT policies and education sector plans rather than treating disability as a separate concern; (b) allocating dedicated, transparently tracked budget lines for assistive technologies and disability-specific professional development; and (c) leveraging public-private partnerships that prioritise local capacity-building, open-source solutions, and sustainable implementation over proprietary imported systems.

Practice Recommendations

Teacher Education and Professional Development: Essential actions include: (a) reforming pre-service curricula to integrate AI literacy, UDL principles, and assistive technology competencies from the outset; (b) providing hands-on professional development on AIEd tools including text-to-speech, real-time captioning, and adaptive platforms; (c) building teachers' critical capacity to evaluate AI tools for bias, cultural relevance, and accessibility; (d) establishing sustained professional learning communities, coaching, and micro-credentialing systems; and (e) incorporating training on data privacy, informed consent, and the ethical dimensions of AI use with vulnerable populations.

Building Local Capacity: Sustainable AI integration requires local expertise and community ownership through: (a) community learning centres providing digital skills training with specialised modules on assistive technologies; (b) support for youth- and women-led technology hubs developing contextually relevant AI applications; (c) dedicated funding for disability-led organisations to co-design and scale AI tools; (d) investment in grassroots initiatives like Masakhane that build NLP tools

for African languages; and (e) strengthened university-community partnerships for participatory research and knowledge translation.

Stakeholder Engagement: Equitable adoption requires all stakeholders to be active participants through: (a) accessible training and information resources empowering families to demand accommodations; (b) mechanisms for students with disabilities and neurodivergent learners to provide feedback and shape implementation; (c) policy incentives motivating schools and teachers to adopt inclusive AI practices; and (d) public awareness campaigns challenging disability stigma and promoting the social model of disability and neurodiversity.

Implementation Principles

Implementation must be guided by: (a) equity-first sequencing, beginning with the most excluded communities; (b) whole-system investment funding the entire ecosystem; power, connectivity, devices, assistive technology, and school-based support rather than isolated pilots; (c) evidence-based decision-making using transparent, publicly accessible metrics; (d) adaptive implementation responsive to local contexts and stakeholder feedback; and (e) long-term commitment that plans for sustained investment, continuous professional development, and technology maintenance and replacement.

AI-driven education holds transformative potential, but only through deliberate, equity-centered action. The challenge is not primarily technological; it is political, social, and ethical. If governments, educators, researchers, disability movements, developers, and funders act collaboratively and with urgency, Africa can pioneer a model of inclusive, locally grounded, and ethically governed AI that ensures every child regardless of ability, neurocognitive profile, geography, or economic status can learn and thrive. The technology must serve learners' realities, amplify their voices, and dismantle rather than reproduce barriers (Mpu, 2024). The choice is clear: invest now in equity, localization, participation, and safeguards, or allow the digital divide to calcify into a permanent learning divide. The time to act is now.

8. Research Agenda

African-led AI and disability inclusion initiatives are reshaping global conversations on equity, innovation, and justice, offering powerful lessons for inclusive development worldwide. Several recent collaborations exemplify the direction this agenda must take.

The AT2030 AI for Disability Inclusion in Africa initiative convened a series of roundtables from February to June 2024, addressing AI and disability inclusion, legal and policy perspectives on access to justice, and innovation perspectives on AI for development in Africa. The overarching conclusions emphasized the need for AI to be developed ethically for persons with disabilities, taking full account of their rights and well-being; for improved digital infrastructure, affordable devices and data, and reliable electricity; and for policy alignment on data safety, ethical AI, and inclusive education (Global Disability Innovation Hub, 2024).

The RAIL Project at Kwame Nkrumah University of Science and Technology (KNUST), in partnership with Assistive Technologies for Disability Trust (AT4D) and Next Step Foundation (NSF), launched a six-month scoping study and stakeholder mapping initiative from March to August 2025, conducting regional consultations in Kenya, Ghana, and Rwanda to establish the evidence base for AI and disability innovation across Sub-Saharan Africa (Hukpati, 2025). Strathmore University's CIPIT report maps AI-enabled assistive technologies in Africa, identifies systemic barriers to their adoption, including unrepresentative training datasets, insufficient policy safeguards, digital skills gaps, and funding shortfalls and recommends concrete steps toward equitable deployment (Kaaniru, 2023).

These initiatives are most effective when deeply collaborative, bridging academia, civil society, government, and technology developers. The GDI Hub roundtables, the Equitable AI Alliance supported by the Zero Project, and Global Alliance Africa's UK-Africa innovation partnership each demonstrate how coordination across sectors anchored in the lived experience of persons with disabilities, can drive meaningful and sustainable change (Global Disability Innovation Hub, 2024).

Global Solidarity: Implications Beyond Africa

The challenges described throughout this paper do not exist in isolation. As UNAIDS Executive Director and UN Under-Secretary-General Winnie Byanyima observed, the world confronts a global crisis of inequality, conflict, climate change, and authoritarianism that no country can address alone. Her call for a common cause across communities, continents, and governments is directly applicable to AI and inclusive education: solidarity, she argues, is a superpower. The COVID-19 pandemic made these dynamics starkly visible. When schools closed globally, students with disabilities bore a disproportionate share of the harm: without physical school environments, and without access to AI-enabled assistive technologies, many lost their primary route to quality education; the right enshrined in Sustainable Development Goal 4 (SDG-4). The pandemic also revealed how inequitably digital infrastructure, devices, and AI tools were distributed, with low- and middle-income countries in the Global South left without the technological resources available to wealthier nations.

The SDGs, signed by all United Nations member countries in 2015, represent a global solidarity movement committing every nation to a better future for all. For Africa and the Global South, SDG-4 quality education for all cannot be achieved without addressing the digital divide that conditions AI's impact on inclusive education. The lessons of this paper, therefore, carry implications beyond Africa: the structural inequities documented here in infrastructure, language, cultural design, governance, and knowledge production are most acutely concentrated in the Global South but are not unique to it. A genuinely global commitment to equity in AI and inclusive education requires that the Global North recognize its role in these inequities, invest in African-led solutions, and allow the innovations emerging from African researchers, disability advocates, and communities to shape the global AI agenda.

9. Conclusion

Digital disparity remains one of the most significant barriers to AI's transformative potential in African education. AI technologies depend on consistent electricity, internet connectivity, devices, and user competency prerequisites that remain unevenly distributed across regions and socioeconomic groups. Where these foundations are absent, AI deepens existing educational inequities rather than redressing them. For learners with disabilities and neurodivergent learners, this is not merely a question of missed enrichment: AI-enabled assistive technologies often serve as the primary gateway to curriculum access. Infrastructure gaps, therefore, do not simply delay innovation; they risk entrenching the exclusion of those who depend most on technological mediation to learn (Mpu, 2023; Muchandiona et al., 2025).

The introduction of AI into African classrooms nonetheless represents a decisive and promising moment. Properly harnessed, AI can provide accessible learning materials, personalized supports, and assistive tools that move inclusive education from aspiration to daily reality. Pilot evidence from South Africa and Kenya demonstrates this potential. However, without intentional, equity-driven implementation, AI risks reinforcing the very divides it claims to close: concentrated in urban, well-resourced schools; designed for dominant languages and cultural contexts; reliant on proprietary systems vulnerable to bias; and sustained only through short-lived pilots that evaporate when external funding ends.

An inclusive AI future requires more than technological advancement; it requires a redistribution of power. Disability-led organizations, including those representing neurodivergent communities, must play central roles in setting priorities, guiding procurement, and monitoring implementation. Teachers require sustained, practice-based coaching not one-time workshops to integrate captioning, screen readers, text-to-speech, adaptive platforms, and accessible formats into everyday instruction. Education systems must prioritize open standards, offline-first tools, and local-language models such as those developed by Masakhane, which lower costs, enhance relevance, and strengthen regional expertise. Data practices must be safe by design, with minimal data collection, robust child protection measures, and regular bias audits.

Scaling inclusive AI requires a pragmatic, sequenced approach: beginning where exclusion is greatest, investing in the entire ecosystem rather than isolated pilots, tying professional development to recognized credentials and classroom coaching, and building a transparent evidence spine of public metrics to track what works. Long-term planning for maintenance, replacement, and community ownership must precede system-wide rollout.

Ultimately, this is both a moral and an educational imperative. AI must bridge, not widen, the gap between learners and learning. If the stakeholders identified throughout this paper, ministries, universities, teacher colleges, disability movements, technology developers, and funders act collaboratively, Africa can pioneer a model of inclusive, locally grounded, and ethically governed AI that benefits every child. The choice is clear and urgent: invest now in equity, localization, participation, and safeguards, or allow the digital divide to harden into a permanent learning divide. For children with disabilities and neurodivergent learners, AI is not merely a tool for personalization but often a prerequisite for access. Screen readers, captioning systems, translation tools, and adaptive platforms can determine whether a learner participates at all. Consequently, infrastructure gaps do not simply delay innovation; they risk entrenching exclusion for those who depend most on technological mediation to access learning (Mpu, 2023; Muchandiona et al., 2025). The time to act and to deliver is now.

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