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Artificial Intelligence in Education for Sustainable Development: A Review of Digital Equity, Inclusive Learning, and Ethical Governance

A.O. Alli
Department of Chemistry, Federal College of Education, Abeokuta, Ogun State.
alliayobami@gmail.com

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Abstract: *This review examines artificial intelligence in education for sustainable development, focusing on digital equity, inclusive learning, and ethical governance. It analyzes how intelligent tutoring systems, adaptive platforms, and assistive technologies advance Sustainable Development Goal 4 (quality education) while connecting with goals on poverty, health, gender equality, decent work, innovation, reduced inequality, sustainable cities, and international partnerships. Research demonstrates AI's potential for personalizing learning, supporting students with disabilities, and expanding access in resource-constrained contexts. However, these benefits materialize only when technologies complement human-centered pedagogical approaches rather than replace educators. Significant challenges persist, including algorithmic bias, data privacy concerns, infrastructure disparities, and digital divides that threaten to exacerbate inequalities if unaddressed. Critical research gaps remain regarding longitudinal impacts on learning outcomes, cost-effectiveness in developing countries, and participatory approaches incorporating teacher perspectives. Realizing AI's educational benefits requires robust ethical governance, substantial infrastructure investment, comprehensive professional development emphasizing human-AI collaboration, and multi-stakeholder partnerships aligned with SDG 17. This review contributes to ethical AI discourse by providing evidence-based recommendations ensuring technological innovation serves human development rather than market imperatives alone.*

Keywords: artificial intelligence, sustainable development goals, inclusive education, digital equity, algorithmic bias, ethical governance

INTRODUCTION

Artificial intelligence (AI) is increasingly being introduced into educational practice, and this development is often linked with new possibilities for more learner-centred forms of teaching and

learning (Garzón et al., 2021; Madaio et al., 2022; Mulyani et al., 2025). At the same time, researchers caution that algorithmic systems are not neutral. When AI systems are poorly designed or rolled out unevenly, they can end up reinforcing the same inequalities that have long affected marginalized learners (Foley & Melese, 2025; OECD, 2024; Shahzad et al., 2024; Tirunelveli et al., 2026; UNESCO, 2025; Zawacki-Richter et al., 2019). The United Nations' Sustainable Development Goal 4 sets out to make sure everyone can access inclusive and fair quality education by 2030. So far, progress has been uneven, and a number of structural barriers still restrict access and participation in many regions (Zickafoose et al., 2024). Research on AI and educational sustainability has grown rapidly in the past few years. Li et al. (2025), for example, show a sharp increase in work exploring how emerging tools, particularly generative AI, might support learning continuity, renewal of teaching practices, and more personalized forms of instruction (Lardhi & Ismail, 2026). Teachers' perspectives also appear to be shifting. According to Binhammad et al. (2024), many educators view AI as a tool that can move classrooms away from rigid instructional routines and toward more flexible learning environments that respond to different student needs (Tripathi et al., 2025). Elshaer et al., (2025) show that assistive technologies powered by AI can help students with disabilities gain better access to learning. Tools such as screen readers, voice assistants, and natural-language interfaces have been reported to support greater independence and academic participation among learners with visual, physical, or cognitive impairments (Dumitru et al., 2026; Giansanti & Pirrera, 2025; Mukhtarkyzy et al., 2025).

The potential influence of AI in education therefore goes beyond simply replacing existing tools. In many discussions, it is framed as part of a broader shift in how teaching and learning are organised (Adamakis & Rachiotis, 2025; Alsuwaida & Alsamiri, 2025; Bantugan et al., 2025; Bezzina & Dingli, 2024). AI-based systems can adjust learning materials as students' progress. This flexibility might help tackle ongoing debates about what makes education meaningful, fair, and focused on deeper understanding, rather than just standardized test results (University Canada West, 2025). These systems can also support inclusive learning by giving students different ways to access information, show what they understand, and engage with course materials. These ideas align closely with the principles of universal design for learning (McKenzie et al., 2023; Haji, 2025). Another area that has drawn interest is using machine learning and educational data to spot students who might be struggling academically. Predictive analytics can sometimes highlight learning difficulties early, allowing teachers or institutions to intervene before problems become more serious (Almalawi et al., 2024; Muranda-Kaseke & Dorcas, 2021; OECD, 2021; Pratya et al., 2025; UNICEF, 2022). In this way, AI could also support broader development goals, such as promoting gender equality and making education more accessible for students with disabilities. Still, the link between AI, digital equity, and long-term learning outcomes is complicated and not always straightforward. The opportunities are clear, but the constraints are equally important. For this reason, a careful review of current evidence is necessary in order to understand how AI can realistically support sustainable and inclusive education. The following section therefore examines these issues in greater detail, as summarized in Table 1 below.

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Table 1: Thematic Classification of Key References

Thematic Category	Representative References	Contribution to Review
AI in Education & SDGs	AlSagri & Sohail (2024); Prasetya et al. (2025); Lardhi & Ismail (2026); Nedungadi et al. (2024); Saini et al. (2023)	Outlines the main ideas that connect AI use in education with the aims of United Nations Sustainable Development Goal 4. It briefly explains how current AI tools used in learning environments may contribute to quality and inclusive education. The discussion also notes that education links with several other goals in the broader United Nations Sustainable Development Goals framework, including poverty reduction, health, gender equality, innovation, and global cooperation.
Digital Equity & Divide	Cao et al. (2025); Rashed et al. (2025); Avanesian et al. (2024); Okunola et al. (2017); Banerjee (2022); Thapaliya & Panta (2025); Matjie et al. (2026)	Highlights the different forms of digital divide that still affect the use of AI in education. These gaps go beyond simple internet access. They include the quality of digital devices, the reliability of connectivity, and differences in digital skills among students and teachers. Such issues can strongly influence whether AI technologies are used in a fair and inclusive way.
Algorithmic Bias & Ethical Governance	Baker & Hawn (2022); Holmes et al. (2026); Boateng & Boateng (2025); Ferrara (2024); Belenguer (2022); Amorim et al. (2018)	Looks at fairness in AI systems used in education. Automated grading tools and algorithm-based assessments can sometimes create biased outcomes if they are poorly designed or insufficiently monitored. Because of this, the discussion points to the importance of clear governance frameworks and responsible oversight when AI technologies are introduced into learning environments.
Inclusive Education & Assistive Technologies	Kooli & Chakraoui (2025); Elshaer et al. (2025); Cabanes & Galigao (2025); Mukhtarkyzy et al. (2025); Fitas (2025); Melo-López et	Considers the use of AI to support students with disabilities. Various assistive technologies, along with approaches linked to universal design for learning, are discussed as ways of improving accessibility. These

	al. (2025); Hussein et al. (2025)	developments show how AI can help remove certain barriers that often limit participation in education.
Teacher Professional Development & Human-AI Collaboration	Chan & Tsi (2023); Madanchian & Taherdoost (2025); Sat (2025); Kashif et al. (2025); Runge et al. (2025); Küçükuncular & Ertugan (2025)	Attention is given to the role of teachers. Many educators are still adjusting to the growing presence of AI tools in classrooms. Some express interest in the possibilities, while others feel uncertain about how these systems may affect their work. For this reason, the review considers teacher readiness, relevant competency frameworks, and practical models for collaboration between educators and AI systems.
Policy Frameworks & Multi-stakeholder Governance	Folorunso et al. (2024); Tsao (2025); Alfiras et al. (2026); OECD (2021, 2023, 2024, 2025)	Considers institutional and policy perspectives. Educational institutions and policymakers are gradually developing ethical guidelines and regulatory approaches for AI use in education. Many of these efforts rely on cooperation between governments, researchers, and technology developers, reflecting the partnership focus of United Nations Sustainable Development Goal 17.

Source: Author's Compilation, (2026).

Table 1 pulls together the main themes that come up across the studies looked at in this paper. When you dig a little deeper into the evidence, a few patterns start to appear. One of the clearest is how much attention goes to algorithmic bias and the tricky questions around ethical governance (Baker & Hawn, 2022; Holmes et al., 2026). Many researchers now point out that AI systems do not automatically produce fair outcomes. In fact, if they are poorly designed or used without careful oversight, they may end up repeating some of the inequalities already present in education. Another area of research looks at assistive technologies and approaches to inclusive learning (Kooli & Chakraoui, 2025). Elshaer et al., (2025) discuss practical examples of how AI tools are already being used to support students with disabilities. Things like screen readers, speech-to-text tools, and other accessibility features come up quite often in the literature. These technologies tie in with concepts of universal design for learning, which aim to create teaching approaches that serve a broader range of students instead of just a select few.

People are starting to pay more attention to teachers and the role they play in all of this (Chan & Tsi, 2023; Sat, 2025). Before, most discussions about AI in education focused almost entirely on the technology itself. Lately, researchers are looking more closely at the people who actually use these tools day to day. Many teachers still feel unsure about how AI fits into their everyday work. Because of this, training and professional development keep coming up as crucial for making these technologies actually useful in classrooms. Even with all this, the research still leaves some important questions hanging. Research that focuses on policy implementation in developing countries is relatively limited (Folorunso et al., 2024). Long-term studies are also quite rare. Much of the available work looks at short-term projects or early pilot programmes, which makes it harder to understand the lasting impact of AI in education. These gaps suggest that further research will be needed, especially studies that examine how AI systems function across different contexts and over longer periods of time.

Theoretical Framework and Conceptual Foundations

Looking at AI-driven educational technologies properly means starting with a solid theoretical base. Examining the technology by itself is rarely sufficient. The surrounding context usually matters just as much, sometimes even more. Instead, it is important to think about how AI links to educational fairness and the bigger picture of sustainable development. Studies show that good learning is not just about finishing courses. It also means keeping students engaged over longer periods. Teachers often need to adjust their methods along the way and modify learning activities so that they better match the needs of individual learners. These elements appear to align closely with United Nations Sustainable Development Goal 4 and its emphasis on lifelong learning opportunities (Alkhawaja et al., 2025; Lardhi & Ismail, 2026; Nguyen et al., 2023; UNESCO, 2026).

The framework of "Education 4.0" provides a useful perspective. Broadly speaking, this body of work looks at how smart technologies can make learning more personal and hands-on. These systems try to match what students already know, what they can do, and what they prefer. But putting them into practice is not always straightforward. A lot depends on the context. Some studies point out that simply providing schools with digital tools does not guarantee similar outcomes everywhere. The effects often vary widely. An approach that works well in one educational setting may produce only limited results in another (Ahmad, 2024; Arias et al., 2025; Başgül & Coştu, 2025; Santos et al., 2024; Shal et al., 2026). At the same time, evidence shows that when these tools are used thoughtfully, they can boost critical thinking, technical skills, and flexibility - things that matter more and more for modern work (Abubakar et al., 2024; Melnyk et al., 2023; Nur, 2025). Other studies suggest that students benefit in the long run when they interact regularly with systems that adapt to their progress (Rabie et al., 2026; Yang et al., 2026; Zervas & Stiakakis, 2024).

A point that appears repeatedly in the literature is that educational technologies are intended to support human development and learning, rather than simply making educational processes faster

or more efficient (Ferdman, 2024; OECD, 2025). In discussions of sustainable learning, continuity usually refers to maintaining learner engagement over extended periods, often supported by ongoing feedback and gradual adjustment of teaching approaches. Renewal is concerned with preventing pedagogical stagnation and involves regular refinement of instructional activities (Fusco, 2025; Gajparia et al., 2022; Koh et al., 2023). Personalization also has an ethical side to it. Learning environments are rarely uniform, so teaching approaches often need to take account of differences among learners. This includes neurodiversity, cultural backgrounds, and the varied personal circumstances students bring into the learning process. Otherwise, learning systems risk reinforcing structures that favor dominant groups (Cobbaert et al., 2024; Christodoulou et al., 2022; Dawson, 2022; Palumbo, 2025; Wolbring & Lillywhite, 2021).

From a human capital point of view, bringing AI into education is often discussed as a longer-term investment in people's abilities. It is not simply a matter of adding new technology to existing systems. Rather, the idea is that these tools may gradually help learners build skills and capacities that remain useful over time, extending beyond the immediate function of the technology itself (Glavas et al., 2025; Lardhi & Ismail, 2026). In this view, learning is not only about preparing students for immediate job-related tasks. It also has to do with preparing learners to cope with futures that are uncertain and constantly changing. Yet the presence of technology alone does not guarantee these outcomes. Much depends on how such tools are actually used in everyday educational settings and the conditions in which they are introduced. The theoretical ideas discussed here offer a way to look more carefully at AI applications in education. They make it possible to ask whether claims about personalized and adaptive learning truly lead to meaningful outcomes across different learning environments (Agwom et al., 2022; Kamalov et al., 2023).

AI Applications for Inclusive Education

Artificial intelligence technologies are being applied in many ways to help learners who face significant barriers. This includes students with disabilities, those from linguistic minorities, and learners in remote areas. Foley & Melese (2025) suggested that AI-powered assistive technologies can be transformative for students across different disability types. For example, screen readers that use computer vision and natural language processing can convert text into speech with improving accuracy. At the same time, speech recognition systems help students with motor impairments communicate more effectively (Cabanes & Galigao, 2025; Cotilla & van der Stappen, 2025; Singh, 2025). Keong, (2025) also draw attention to AI-driven forms of personalized learning. In simple terms, these systems try to adjust the material as students move through it. The content may shift depending on how a learner is progressing, and in some cases the system attempts to respond to factors such as cognitive load or even emotional signals during learning (Keong, 2025; Chen, 2025; Halkiopoulos & Gkintoni, 2024). Still, access to these technologies is far from even. Smartphones might be widely used in many areas, but the reality is messier when you dig deeper. Not all devices are equal, and internet connections can be patchy, especially in rural schools. Because of this, the advantages of these tools are not shared evenly. Mwansa et al., (2025); Rashed et al., (2025) highlight the need for more intentional investment in digital infrastructure if

these technologies are going to work well in different school settings (Alam & Forhad, 2023). Often, these tools are seen as practical ways to bring inclusive education principles into everyday classrooms. Some researchers refer to this as the use of "adaptive content and resources." In simple terms, the materials are designed to shift or adjust according to what a particular learner needs at a given moment. For example, students who are visually impaired can use a mix of optical character recognition and text-to-speech tools to read printed materials they otherwise could not access. Rather than depending fully on manual transcription, printed materials can be turned into audio or digital formats that are easier to read. In certain cases, students who struggle with communication might use augmentative and alternative communication systems to express their thoughts. Some of these tools even use predictive algorithms to help speed up message creation, which can make communication smoother and a bit easier during classroom activities (Noor et al., 2026; Fitas, 2025; Sennott et al., 2019). The personalization goes beyond disability support. AI systems can account for learning styles, prior knowledge, and even cultural backgrounds, helping to advance SDG 4.7 on education for sustainable development and global citizenship (OECD, 2025; Osman & Bashir, 2026; Rončević & Rieckmann, 2025; Tafese & Kopp, 2025). The benefits of these tools, however, do not happen automatically. They really depend on a bunch of bigger-picture issues being handled. Uneven digital infrastructure, teachers not feeling fully prepared to use these tools, and the tricky questions around ethics and oversight all matter a lot. These are not minor hurdles, and the next sections will dig into them in more detail.

Digital Equity and the Persistent Divide

Even with all the advances in technology, there are still big gaps. Some students simply cannot get proper access, devices vary a lot in quality, and how these tools are actually used is all over the place. Sometimes, these gaps end up making the inequalities that already exist even worse. Some researchers have even described this as the "new inequality in equality" (Mirazchiyski, 2025; Vassilakopoulou & Hustad, 2023; Okunola et al., 2017). Take, for instance, students in less advantaged areas - they often depend mainly on smartphones rather than proper computers, which really restricts the kinds of tasks they can handle. That can really limit what they are able to do, especially when tasks need more powerful or complex tools (Banerjee, 2022; Kuş, 2025; Paterna et al., 2024). At the same time, there are what some researchers describe as "physical environment appropriateness divides." Not all students have quiet study spaces or the social support needed to use technology effectively (Cao et al., 2025; Keser Aschenberger et al., 2023; Nagy & Dringó-Horváth, 2024). Even though internet coverage is spreading, the reality on the ground is patchy. Connection quality varies a lot, digital skills are uneven, and the infrastructure that actually supports learning is not evenly available everywhere (Afzal et al., 2023; Avanesian et al., 2024; Butt et al., 2026; Fang & Nie, 2025; Martini & Sgambato, 2025). These gaps appear on several levels, each with different implications for the Sustainable Development Goals. The first issue is simply having the devices and a reliable connection - this links straight to SDG 9 on industry and infrastructure, and SDG 11 on sustainable cities. Then there is the question of skills: people need to actually know how to use the technology properly, which ties into SDG 4.4 on technical and vocational learning. Beyond that, there is the persistent problem of algorithmic bias and data

discrimination, which remains a serious concern. In practice, these biases can systematically disadvantage marginalized groups, linking closely to SDG 10 (reduced inequalities) and SDG 5 (gender equality) (Repsol, 2026; UN Women, 2026; O'Sullivan et al., 2021; Sever et al., 2025; Zyoud & Zyoud, 2025).

Simply putting the technology in place does not automatically make things fair. In some cases, just giving people access is not enough - without the right support, it can actually make the inequalities that already exist even worse. It is crucial to have policies that really address infrastructure, teacher training, and ethical oversight of algorithms. If these areas are neglected, the potential of AI and other digital tools could backfire, ending up excluding students instead of supporting them. Understanding these overlapping issues of digital equity is essential when trying to figure out how AI can actually contribute to sustainable development (Koukaras et al., 2026; Sajja et al., 2026; Matjie et al., 2026; Rahman et al., 2026; Tsao, 2025; Thapaliya & Panta, 2025).

Algorithmic Bias and Ethical Challenges

Using AI in schools can create serious fairness problems, especially for students who have already faced disadvantages. Bias shows up in multiple ways. For instance, automated essay scoring systems usually depend on data from human-graded work. If those grades carry bias, the AI just repeats the same patterns, which often hits students from marginalized groups harder (Ferrara, 2024; Boateng & Boateng, 2025; Belenguer, 2022). Similarly, predictive models used for admissions or tracking how students do over time also show gaps. In a lot of cases, these algorithms tend to perform better for students from wealthier or more privileged backgrounds (Amorim et al., 2018). Baker & Hawn, (2022) point out that even the way classroom software is structured matters. “Hierarchical dependencies” in schools can influence how fair the AI seems to be (Baker & Hawn, 2022). So, it is not just about the code. Context plays a huge role.

Bias goes deeper than individual decisions. The training data itself often reflects old inequalities - who gets resources, which students get attention, and what content is emphasized. This means that even “objective” AI tools can carry forward existing disparities (Lodhi & Roehrig, 2026; Wieczorek et al., 2025). When AI is used to suggest courses, assign students to special programs, or even guide disciplinary actions, it can worsen inequalities instead of fixing them. Because of this, tackling bias is not just technical. We need policies and rules, alongside careful model design and ethical guidelines. In practice, combining these approaches is the only way to make AI systems genuinely fair (Poornesh, 2024; OECD, 2021).

Teacher Professional Development and Human-AI Collaboration

When it comes to using AI in classrooms, it really hinges on the teachers their skills, their judgment, and how confident they feel with the technology make all the difference. It is not enough to just have the technology sitting there. Teachers have to know how to use AI in ways that actually help learning, while still holding on to the decisions that only they can make. Lariba & Ibojo, (2025) reported that lot of teachers feel uneasy about these tools. Some worry that AI might take

over parts of their job. At the same time, they notice that AI can help with routine tasks, such as grading, keeping track of attendance, and preparing lessons (Tripathi et al., 2025).
Pre-service teachers often feel even more pressure (Sat, 2025). When schools push technology but provide little training, stress rises. This worry among teachers often seems more about gaps in training than anything about AI itself (Sat, 2025; Duc et al., 2025). When teachers really get a handle on using AI, many say it actually gives them room to focus on the stuff that matters most - connecting with students, mentoring them, and making those professional calls that no machine can take over (Alwakid et al., 2025; Belloula, 2025). In this sense, AI works more like a classroom helper than a replacement. It can handle repetitive or admin tasks, letting teachers put their energy into areas that need a human touch - reading emotions, making ethical choices, and building trust (Garzón et al., 2025). The evidence points to the same thing: when AI is treated as a helper, teachers can spend more time on higher-level work - problem-solving, mentoring, and designing lessons that actually engage students. It really comes down to balance: machines handle the routine stuff, humans handle the human side. These challenges are not only about the tech itself - they tie straight into the bigger picture of what really makes education high-quality and sustainable. Giving teachers solid professional development and having clear institutional support in place seems essential if these tools are going to work as intended. Without proper support, AI can end up adding pressure instead of easing it. The next part looks at ways schools might help teachers work effectively with AI, making sure the technology actually supports learning rather than creating extra stress (Fitria, 2023; Hou et al., 2026; Madanchian & Taherdoost, 2025; UNESCO, 2025).

SDG Integration and Sustainable Development Outcomes

AI in education does not just tie into SDG 4. AI does not just affect education it ties into other global goals too, sometimes in ways that are not obvious right away (Saini et al., 2023). To really get a handle on this, we need ways of looking at it that show both the benefits and the trade-offs across different goals. Saini et al., (2023) shows that using AI in learning clearly supports SDG 4, but it also has knock-on effects: it can help SDG 8 by building skills for work, push SDG 9 by advancing technology, and support SDG 17 through international research partnerships (Asrian, 2024; AlSagri & Sohail, 2024; Ametepey et al., 2024). There is even evidence that higher education, when supported by AI, can indirectly cut carbon emissions and encourage the use of renewable energy (Iqbal et al., 2025; Sahu et al., 2024). This shows that education contributes to broader development through human capital, not just immediate learning outcomes (Zhiying & Sidi, 2025; Iqbal et al., 2025; Sahu et al., 2024). For example, international university partnerships. These networks help share knowledge, develop curricula, and build capacity in line with SDG 17 goals (Drissi et al., 2025).

In practice, this show that sustainable development is all tangled up to education quality is not just about grades or skills, it also pushes social change. Using AI in education can, for example, help reduce poverty (SDG 1) by opening up more economic opportunities. At the same time, it can back

gender equality (SDG 5), especially when programmes focus on supporting women and girls in STEM (AlSagri & Sohail, 2024; Ferk Savec & Jedrinović, 2025).
The idea of "sustainable quality learning" highlights three dimensions: continuity, renewal, and personalization. Together, these help people develop skills and resilience that go beyond immediate job needs and prepare them for a changing world (Lardhi & Ismail, 2026; MuhammedZein & Abdullateef, 2025). But these benefits only happen if access is fair and AI is implemented ethically. If these things are ignored, technology can end up making inequalities worse instead of better. Paying attention to these overlapping effects matters a lot when trying to figure out how AI can really help with sustainable development not just in schools, but across society more broadly.

Policy Implications and Governance Frameworks
Getting AI to actually work in schools is not just about having the tech itself. It is really about the policies that guide it, the people using it, and the bigger systems it sits within. Governance frameworks need to encourage innovation but also make sure fairness and ethics are not ignored. Alfiras et al., (2026); Kooli & Chakraoui, (2025) highlight a few key things that matter a lot: keeping student data safe, making sure algorithms are transparent, and looking closely at how AI impacts fairness and equity in schools (Alfiras et al., 2026; Kooli & Chakraoui, 2025).

In developing countries, things get even trickier. Policies alone do not do the job. Governments, private companies, and civil society really have to work together. Without those kinds of partnerships, AI frameworks often end up patchy or just do not get applied properly (Folorunso et al., 2024). Looking at how other countries handle it, it seems the best governance involves coming together of different players at the same time such as official agencies, schools, tech developers, and community groups all pitching in (OECD, 2023; Benefo et al., 2022).

The rationale for this is that AI is not just a tool. It operates within social and organizational contexts. How well it works really depends on the school itself, the rules and policies that are in place, and even local cultural factors, not just on the way the AI was programmed. Educators emphasize the need for clear guidelines, hands-on training that builds confidence, and collaborative structures where teachers can experiment and adopt AI slowly (OECD, 2023). There is also the issue of data. If student information is treated as a commodity, it can create harm. Governance should make sure algorithms support decisions while humans remain in charge and accountable (Fitria, 2023). Partnerships across borders, especially aligned with SDG 17, also help by sharing practices, coordinating research, and making sure resources reach schools that need them most.

Future Research Directions and Limitations
There is still a lot we do not know about AI in education. Most of the research focuses on short-term effects, and we really do not have a clear picture of what happens over the long run (Greif et al., 2025; Melo-López et al., 2025). Context appears to matter a great deal - different schools, the

resources they have, and local cultural factors can all change how well AI actually works. Yet, many studies hardly take these differences into account. Evidence from developing countries is especially thin, and very little looks at social-emotional learning or whether AI is cost-effective where resources are tight (Hussein et al., 2025). Even with all the trends around AI in education, there is still not much that really gets into how it could actually help hit SDG 4. Things like whether policies line up, or how new strategies might genuinely support sustainable development, tend to get ignored (Mohammad, 2025; Garzón et al., 2025).

Part of the challenge is that implementing AI in schools is still new. Digging into this properly is not easy. What is really needed are long-term studies that can follow learning over time, rather than just taking a snapshot of test scores from a single semester (Vaghjee, 2025). And educational inequalities as discussed by Baker, R.S., Hawn, (2022) claimed that they cut across gender, disability, socioeconomic status, and geography. Discussing these factors in together, hides critical differences (Keller et al., 2023). The ethical awareness and responsible use of GenAI" theme emerging from teacher research indicates need for participatory investigation methods that incorporate educator and student perspectives rather than technocentric evaluation frameworks. Addressing these research limitations constitutes essential groundwork for evidence-based policy development and implementation strategies that maximize AI's contribution to inclusive education and sustainable human development.

CONCLUSION

Artificial intelligence in education offers some really big opportunities, especially for inclusive learning and advancing sustainable development. At the same time, though, it can make existing inequalities worse if we are not careful. AI tools things like personalized learning systems, intelligent tutoring, and assistive technologies can make education more accessible and help students learn better, but this only works if implementation is fair and thoughtful. Problems like algorithmic bias, gaps in digital access, and teacher concerns about being replaced are serious, and they cannot be ignored. Dealing with them requires ethical governance, investment in infrastructure, and professional development that actually prepares teachers to work alongside AI. Partnerships, especially those aligned with SDG 17, are also crucial.

The contribution of AI to SDG 4 and related goals does not happen automatically. It only comes about when technology is used in ways that center on human learning supporting continuity, renewal, and personalization rather than pushing all students into standardized molds. Digital equity is more than just giving students devices. We need to think about the quality of those devices, how reliable connectivity is, whether students and teachers know how to use the tools effectively, and if the algorithms themselves are fair. Teacher anxiety about being replaced by machines is real, and professional development needs to address this directly, showing educators how to collaborate with AI while still being the moral and relational core of education.

Getting the most out of AI in education means sticking to equity-first design, using evidence to guide implementation, and collaborating internationally. Without that sort of careful attention, the promise of AI can quickly end up making existing inequalities worse rather than actually helping people thrive across all the different areas of sustainable development.

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