



Utilisation and Adaptability of Artificial Intelligence in Nigerian Classrooms: Implications for Human Capital Development and National Growth

*¹Ogwo, L. C., & ²Kwelle, C. O.

¹Department of Educational Technology, Ignatius Ajuru University of Education, Port Harcourt, Nigeria

²Department of Curriculum Studies and Educational Technology, University of Port Harcourt, Nigeria
Rivers State

*Corresponding author email: lloyd.ogwo@iaue.edu.ng

Abstract

Education continues to be a crucial driver of human capital development and national prosperity. In Nigeria, schools are unable to provide quality education due to chronic difficulties such as excessive class sizes, unfair distribution of resources, and differences in learning outcomes. The study explores the use and adaptability of contemporary educational innovations in the Nigerian classroom, focusing on tactics that improve the effectiveness of teaching, individualize the learning experience and support institutional administration. The study emphasizes the need to adapt educational techniques to the local cultural, linguistic and socio-economic context in an effort to achieve fair access and lasting improvements in learning results. The study underscores that the development of context-sensitive, ethically directed, and participative methods to education can increase workforce readiness and contribute meaningfully to long-term national growth.

Keywords: Artificial Intelligence (AI), Nigerian Classrooms, Utilization, Adaptability, Ethical Challenges

Introduction

The rapid development of digital technologies has changed many spheres of society, and education has become one of the most crucial areas of this revolution. Artificial intelligence (AI) has attracted particular attention among emerging technologies for its capacity to imitate human cognitive processes, assess vast amounts of data and help decision-making in complicated learning contexts. Education systems around the world are increasingly looking at how standard artificial intelligence may increase the efficiency of instruction, tailor learning experiences and boost institutional administration. Today, classrooms are integrating AI-powered solutions like intelligent tutoring systems, automated assessment platforms and adaptable learning environments to benefit teachers and learners alike. These innovations are changing traditional teaching approaches progressively and providing more options to improve educational results (Holmes & Porayska-Pomsta, 2023).

In recent years, the debate on the use of artificial intelligence in education has escalated in Nigeria as policymakers and scholars look for ways to improve the quality and access to schooling. The Nigerian education system continues to face ongoing issues such as overcrowded classrooms, unequal distribution of learning resources and discrepancies in learning outcomes among the regions. Within this framework, AI has been viewed as a possible technology approach to improve instructional delivery and increase access to excellent education. Studies show that AI-based systems can help teachers track students' progress, provide individual feedback, and diagnose learning problems early,

resulting in more responsive teaching methods (Zawacki-Richter et al., 2020). This has resulted in an increasing interest in the use of AI tools to improve current teaching processes in Nigerian classrooms.

Despite these promises, the adoption of artificial intelligence (AI) tools in Nigerian education poses fundamental challenges about their applicability to local reality. A large number of the AI tools deployed in educational contexts are built in technologically advanced nations and imported into Nigerian institutions with minimal contextual adaptation. These technologies generally presuppose reliable internet access, solid digital infrastructure and pedagogical traditions that can vary significantly from those prevalent in many Nigerian schools. Consequently, the deployment of AI in the classroom may not necessarily be in concert with the social, linguistic and institutional contexts of Nigerian instructors and learners. Therefore, scholars have suggested that the usefulness of AI in education is not only dependent on technological sophistication but also on its alignment with the cultural, economic and pedagogical conditions of the context where it is deployed (Luckin et al., 2024).

The question of adaptation is particularly significant when the wider developmental role of education is considered. A fundamental theme in Nigeria's national development goal is the creation of a skilled and innovative workforce that can compete in an increasingly digitised global market. The development of human capital, namely the increase in knowledge, skills and productive capacities of people, continues to be a crucial pillar for sustained economic progress. When appropriately integrated into the teaching and learning processes, artificial intelligence (AI) tools can assist learners in acquiring skills, critical thinking and technology literacy, contributing to this goal. But if the adoption of AI is primarily based on externally developed systems with minimal local involvement in the design and implementation, then the educational sector risks remaining technologically dependent rather than becoming a centre of innovation and capacity building (Williamson & Eynon, 2020).

Therefore, it has become a significant field of exploration to determine how much AI is being utilised in the Nigerian classroom, and how much AI can adapt to the local educational context. An analysis of the opportunities and restrictions of integrating standard artificial intelligence can inform whether the technology can significantly assist learning and institutional effectiveness. More crucially, such a study provides a platform for assessing the larger implications of AI adoption for human capital formation and national growth. This study thus examines the use and adaptability of artificial intelligence in Nigerian classrooms and investigates how its integration may contribute to strengthening educational outcomes, enhancing workforce readiness, and supporting Nigeria's long-term national growth in an increasingly technology-driven world.

Ethical Challenges of AI in Nigerian Classrooms

The growing use of artificial intelligence in education has frequently been accompanied by hopeful assertions about its ability to improve instructional efficiency, personalize learning, and boost academic performance. These expectations show the possible gains of AI in teaching and learning. Nevertheless, they ignore the ethical intricacies of incorporating modern technologies into educational systems. Technologies are not value-neutral tools; they incorporate the assumptions, values, and worldviews of the environments in which they are produced. Most of the AI applications currently available in Nigerian classrooms are developed in technical ecosystems outside Nigeria. Consequently, the design concepts that inform these systems may not fully represent the social realities, cultural norms and educational practices that characterise Nigerian schools. As noted by scholars, the social values contained in the design of technology can affect the manner in which knowledge is organised, communicated and assessed in learning settings (Williamson & Eynon, 2020).

One significant ethical challenge is the matter of data governance and representation. Large datasets are essential for artificial intelligence systems to train and make decisions. In most cases, these datasets are largely based on Western educational environments, implying that the linguistic features, cultural allusions, and pedagogical approaches within them may not be compatible with Nigerian learning contexts. Research on AI in education shows that such imbalances can lead to algorithmic bias, as automated systems interpret student behaviour and academic performance using frameworks not designed for local educational conditions (Zawacki-Richter et al., 2020). When these biases are replicated in technology used in classrooms, they may shape how students' skills are evaluated, how learning issues are interpreted, and how instructional recommendations are made.

Another part of the ethical dilemma is the marginalisation of indigenous knowledge systems in digitally mediated learning environments. Educational technology favouring global dominant knowledge systems may inadvertently curtail the visibility of locally relevant knowledge traditions, languages and problem-solving methodologies. This mismatch can lead to tensions between technical modernisation and cultural continuity in places such as Nigeria, where education is crucial for the preservation of cultural legacy and the preparation of students for involvement in the global economy. Studies have revealed that the deployment of educational technologies, without intentional attention to local epistemologies, can create subtle instances of cultural displacement, where external knowledge systems serve as primary reference points for teaching and learning (Holmes et al., 2021).

Moreover, there are ethical consequences of AI use in classrooms that also include issues of dependency on technology and educational sovereignty. If Nigerian schools rely heavily on externally built AI platforms and do not establish internal ability for design, adaptation and governance, the education sector may continue to rely on external technical infrastructures. This dependence can stifle local innovation and the ability of educators and policymakers to adapt technological tools to national educational agendas. Thus, the ethical issues of AI in the Nigerian classroom are not only to be tackled by regulating the use of technology, but also by boosting local participation in technological development, the use of inclusive datasets, and the adoption of design strategies that take into account the cultural, linguistic and pedagogical diversity of Nigerian society.

These ethical issues are important to understand when trying to evaluate the wider consequences of the deployment of AI in the Nigerian education system. Artificial intelligence may promote learning and improve instructional practices, but its full usefulness is realised only when ethical issues around cultural representation, data governance, and technical autonomy are considered. This will guarantee that AI integration benefits not only educational innovation but also the wider goals of human capital development and sustainable national growth.

AI, Access, Equity, and Educational Quality

Besides the ethical issues of artificial intelligence in education, the practical benefits that the technology brings to improve access and quality of education should also be considered. The positive developments in the education sector notwithstanding, the system is nonetheless bedevilled with structural difficulties that are impacting learning outcomes in many parts of the country. These include the dearth of trained teachers, huge class sizes, restricted instructional materials and large discrepancies between schools in urban centres and schools in rural or impoverished populations. This type of circumstance typically limits the ability of teachers to provide individual attention to students and limits the opportunity for appropriate monitoring of learning progress. In this sense, artificial intelligence has been presented as a technical solution able to assist more responsive and adaptable teaching and learning processes.

AI-powered educational solutions can enable teachers to manage varied classrooms by providing a customised learning approach that would be challenging to achieve through traditional instructional approaches alone. For example, adaptive learning platforms can evaluate trends in students' responses and adapt instructional content based on individual learning pace and comprehension levels. Likewise, intelligent tutoring systems can provide additional explanations and practice problems for students in need of extra help, and automated assessment technology can help teachers grade assignments faster and provide feedback more quickly. Research in digital learning technologies suggests that these types of AI-backed instruction can lead to increased student engagement and help educators discover learning issues earlier in the instructional process (Garcia-Martinez et al., 2023).

Experiences from higher education institutions in Nigeria also reveal that some AI-based applications have begun to support teaching and learning activities. Universities have adopted several tools such as automated feedback systems, academic chatbots, and digital advising platforms to help professors cope with enormous student populations and answer basic academic questions. Empirical investigations have shown that such systems can accelerate the transmission of feedback, foster contact between students and instructors, and aid in the more efficient management of learning activities in large-sized classrooms (Akinsola et al., 2020; Ajayi et al., 2021). Although these advancements are yet relatively restricted in scope, they indicate the promise of artificial intelligence (AI) technology in supporting instructional procedures in Nigerian educational institutions.

But AI's role in creating egalitarian chances in education is still uneven. Access to digital infrastructure, including consistent electricity, dependable internet access, and appropriate technological gadgets, is not uniform between schools and areas. This constraint reduces the ability of institutions in many rural or low-resource regions to adopt or maintain AI-enabled learning systems. Moreover, teacher readiness is another crucial element determining the efficient usage of educational technologies. Teachers without proper training in digital pedagogy and in integrating technology may find it challenging to employ AI tools in ways that truly promote learning. Therefore, scholars stress that technology innovation alone cannot ensure improved educational outcomes. Instead, the effectiveness of AI depends on supportive infrastructure, institutional readiness, and well-coordinated policy frameworks that guide implementation (Garcia-Martinez et al., 2023).

Therefore, although artificial intelligence can offer intriguing opportunities to increase access to learning resources and improve the quality of instruction, its benefits are not automatically shared by all parts of the education system. If the infrastructure disparities and capability gaps are not consciously addressed, the introduction of AI could inadvertently exacerbate the already existing inequities between well-resourced institutions and others that are working under considerable restrictions. So, to ensure AI is a force for good in access, equality and quality of education in Nigeria, we need policies and practices that prioritize inclusive technological development, enhance teacher capacity and adapt digital resources to the realities of varied learning settings.

AI, Education, and Socio-Economic Development

Education remains at the heart of generating human capital that drives economic growth, innovation and national competitiveness. Persistent gaps in skill development, graduate employability and worker productivity in Nigeria underscore the need for more responsive educational systems. Artificial intelligence offers ways to tackle these difficulties through facilitating individualised learning, measuring skill development, and connecting educational outputs with labour market needs. Adaptive learning platforms and data-driven instructional technologies can help students acquire relevant skills efficiently, while enabling teachers to provide focused support (Acemoglu et al., 2022).

With the global economy continuing to evolve, there is a growing need for digital literacy as well as problem-solving and critical thinking skills. Artificial intelligence can facilitate the development of these competences by recognising skill gaps and guiding learning routes in line with economic priorities (World Economic Forum, 2020). In the Nigerian context, the use of AI in education can promote employability, improve preparation for the workforce and contribute to sustainable national prosperity. However, these benefits depend on having the right infrastructure in place, teachers who are ready to use the technology, and regulations that assure equal access. This highlights the fact that technology alone cannot drive growth; it has to be part of a broader set of educational and economic plans.

Harnessing AI for Sustainable National Growth

Sustainable national development involves more than economic growth, but also purposeful investments in education, health, equity and institutional capacity. Among the Sustainable Development Goals, quality education is of special importance, as it lays the foundation for skilled human capital and long-term societal progress (Kopnina, 2020; Uleanya & Yassim, 2025). The underfunding of schools, poor infrastructure and existing gaps in worker competencies have hampered this goal in Nigeria, impeding the country's capacity to properly tap into its human resources.

There is a strategic opportunity for artificial intelligence to improve in these areas, thru improved learning experiences, broader access to education materials and enabling data-driven decision-making in schools. Artificial intelligence can help personalize instruction to meet student needs, enhance teacher performance and enable a more equitable allocation of educational support. But its ability to drive sustainable development will depend on its incorporation into coherent national frameworks. Human capital gains alone are not enough; they must be matched with policies that consider local socio-economic conditions, investment in research and innovation, and institutional frameworks to guarantee technology fulfils national interests (Bekele et al., 2025). Embedding AI in these strategic frameworks will enable Nigeria to leverage technology not only as a technological tool but as a means of wider sustainable development.

From Classrooms to Nation-Building

Education is not only about the transfer of knowledge; it is a major factor in the development of civic values, social cohesion and the ability for national creativity. When seen in this way, the use of artificial intelligence in learning environments has ramifications that go beyond individual performance, to larger processes of nation-building. Many AI-powered educational systems focus on personalized, technology-facilitated learning, which could be in stark contrast to Nigeria's deep history of collaborative and community-based education. Studies suggest that over-reliance on screen-based, customised learning models may limit possibilities for peer contact, collaborative problem-solving and social skills development for collective participation (Lai et al., 2023; Kouam & Muchowe, 2025).

AI also provides tools that help bolster national development goals by improving productivity, teacher and professional development, and evidence-based decision-making in many areas. The problem is to reconcile the technology advantages with the need to protect and enhance the social and cultural dimensions of learning. Educational systems can cultivate students who are skilled and knowledgeable, but also socially adaptable, culturally grounded and able to contribute meaningfully to the cohesion and progress of the nation by embedding AI into the fabric of learning communities in ways that improve group learning, mentorship and community engagement. Artificial intelligence can thus be a catalyst for educational innovation and an advocate for sustainable nation-building.

Building Indigenous AI for Sustainable Development

Indigenous epistemologies and artificial intelligence (AI) offer a paradigm for sustainable development that advances beyond the extractive use of technology toward creative models based on stewardship, reciprocity and long-term health. Roy (2025) notes that aligning AI with Indigenous knowledge systems (IKS) can assist cultural revitalisation, ecological management, and community empowerment in ways that traditional technological paradigms cannot.

An important aspect of creating Indigenous AI for sustainable development is the ethical co-creation of technology with Indigenous communities, not on their behalf. This approach recognises Indigenous peoples not simply as providers of data, but as knowledge bearers whose epistemic frameworks inform the questions posed, as well as the metrics evaluated, in artificial intelligence systems. Fundamentally is the concept of data sovereignty, which posits that Indigenous people should have control over how their cultural and ecological data are collected, analysed, and used. Crucially, this moves AI development from a top-down technocentric approach to one grounded in relational accountability where AI is able to support community goals such as language preservation, cultural education, and preservation of the environment (Srivastava & Upadhyay, 2024).

Indigenous AI for sustainable development in practice: addressing cultural and ecological domains For example, hybrid models have been developed that train artificial intelligence systems on Indigenous ecological indicators for enhanced biodiversity monitoring and natural resource governance. The models incorporate traditional ecological knowledge from several generations, and integrate this with remote sensing, predictive analytics and participatory design to promote ecological resilience (Roy, 2025). In these systems, Indigenous peoples are not only recipients of algorithmic outputs, but active agents in shaping what sustainability means to them, which could include, for example, prioritising the balance of ecosystems over efficiency.

Another key application domain is digital empowerment thru culturally sensitive AI technologies. Generative AI has been researched as a way to protect endangered languages and improve cultural identity, providing sustainable digital inclusion rather than perpetuating current injustices (Srivastava & Upadhyay, 2024). Similarly, regulations and guidelines created in partnership with UNESCO emphasise the necessity of culturally sensitive AI techniques that respect Indigenous perspectives and do not inappropriately appropriate cultures (González Zepeda & Martínez Pinto, 2023).

Governance institutions need to be reconfigured to give priority to Indigenous epistemologies if they are to make a significant contribution to sustainable development in Indigenous contexts. This involves legislative acknowledgement of Indigenous rights in digital spaces, participatory governance models and AI research procedures that include Indigenous ethical standards from inception to implementation. These models reaffirm that sustainability is not solely a technological task, but also a cultural and political challenge demanding solutions that uphold

community values, preserve cultural heritage and promote intergenerational wellbeing (UN Permanent Forum on Indigenous Issues, 2025).

Conclusion

Educational innovation provides great prospects for improving teaching, learning and human capital development in Nigeria. Systemic concerns including resource disparities, talent gaps, and overcrowding in classrooms can be addressed with effective techniques. These tactics, however, are successful only if adapted to the local context, respecting the cultural, language and pedagogical realities. Failure to consider these issues risks reinforcing existing inequalities and reducing the relevance of education to wider societal and economic objectives. Improving Nigeria's educational outcomes and its long-term development prospects hinges on incorporating locally grounded knowledge, building teachers' skills, and prioritizing inclusive approaches. Artificial Intelligence has great potential to reshape Nigerian Classrooms and to build human capital development. Although there are limitations, intentional planning, legislative assistance and educational investment can enhance flexibility and utilization. AI is a technology to be used to facilitate educational development and sustained national growth, not to replace human teaching.

Artificial Intelligence has huge potential to redefine Classrooms in Nigeria and develop Human capital. Despite the limitations, careful planning, policy support and investment in education can increase adaptation and utilization. Artificial Intelligence should be that of as a tool to enable education progress and sustained national growth, not as a replacement for human teaching.

Suggestions

1. Design and implement curricula that reflect local cultural, social, and linguistic contexts to improve engagement and learning outcomes.
2. Invest in ongoing training programs that build pedagogical skills, classroom management expertise, and adaptive teaching strategies.
3. Improve access to classrooms, learning materials, and educational facilities, particularly in underserved and rural communities.
4. Involve educators, communities, and policymakers in decision-making to ensure that educational innovations are relevant, inclusive, and sustainable.
5. Embed local knowledge, cultural traditions, and problem-solving approaches into the curriculum to preserve heritage and foster relevant learning.

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