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Vol. 2



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SUSTAINABLE EDUCATION IN AFRICA

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4

ARTIFICIAL INTELLIGENCE AND ADULT EDUCATION DEVELOPMENT IN NIGERIA

By

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Abstract

The advent of artificial intelligence (AI) has opened new frontiers in education, presenting transformative opportunities for adult learning in Nigeria. Adult education, which encompasses literacy, vocational training, and lifelong learning, faces persistent challenges in the country, including limited access, inadequate instructional resources, and a shortage of qualified educators. This chapter examines the impact of AI on adult education development in Nigeria, highlighting its role in enhancing access, personalizing learning experiences, automating assessment, supporting instructors, promoting digital literacy, and improving cost efficiency. While AI provides numerous benefits, its adoption also presents challenges such as the digital divide, data privacy concerns, limited digital skills among learners and educators, and the need for culturally relevant content. The chapter concludes that strategic integration of AI, supported by robust infrastructure, policies, and training, can significantly enhance the quality and reach of adult education in Nigeria, contributing to national development and lifelong learning initiatives

Keywords: Adult education, artificial intelligence (AI), Education



4.0. Introduction

The rapid advancement of Artificial Intelligence (AI) is transforming virtually all sectors of human endeavor, including education. As a branch of computer science concerned with the development of systems capable of performing tasks that typically require human intelligence—such as learning, reasoning, problem-solving, and decision-making—AI has introduced innovative approaches to teaching, learning, and educational management. In the context of adult education, AI presents significant opportunities to enhance access, quality, and efficiency in the delivery of learning programmes, particularly in developing countries like Nigeria.

Adult education in Nigeria plays a critical role in addressing issues such as illiteracy, unemployment, poverty reduction, and lifelong learning. It encompasses formal, non-formal, and informal learning processes designed to meet the educational needs of adults who may have missed out on conventional schooling or seek to improve their knowledge and skills. Despite its importance, adult education in Nigeria continues to face numerous challenges, including inadequate funding, poor infrastructure, shortage of qualified facilitators, and limited access to modern instructional technologies. These challenges have hindered the effective development and sustainability of adult education programmes across the country.

The emergence of AI offers a promising pathway to address some of these longstanding issues. Through tools such as intelligent tutoring systems, adaptive learning platforms, automated assessment systems, and data-driven decision-making processes, AI can support personalized learning experiences tailored to the unique needs of adult learners. For instance, AI-powered applications can provide flexible learning schedules, real-time feedback, and customized content delivery, thereby improving learner engagement and outcomes. In addition, AI can assist educators and administrators in planning, monitoring, and evaluating adult education programmes more effectively.

AI-driven technologies can expand access to adult education in Nigeria by bridging geographical and socio-economic barriers. With the increasing penetration of mobile devices and internet connectivity, AI-enabled platforms can deliver educational content to remote and underserved communities, thereby promoting inclusivity and equity in education. This aligns with global educational priorities such as lifelong learning and sustainable development, particularly in achieving inclusive and equitable quality education for all. The integration of AI into adult education development in Nigeria is not without challenges. Issues such as digital illiteracy among adult learners, inadequate technological infrastructure, high cost of implementation, data privacy concerns, and resistance to technological change pose significant barriers to the effective



adoption of AI. Additionally, there is a need for appropriate policies, capacity building, and strategic planning to ensure that AI technologies are utilized in ways that are culturally relevant, ethically sound, and sustainable.

In view of the above, this chapter examines the nexus between artificial intelligence and adult education development in Nigeria. It explores the potential benefits of AI in enhancing adult learning, identifies the challenges associated with its adoption, and discusses strategies for effective integration. By doing so, the chapter seeks to contribute to the growing body of knowledge on the role of emerging technologies in advancing adult education and promoting national development.

4.1. Conceptual Terms

▪ Concept of adult education

Adult education as all organized educational processes, whether formal or non-formal, through which adults develop their abilities, enrich their knowledge, and improve their technical or professional qualifications to meet their needs and those of society (UNESCO, 2020). Malcolm Knowles (nd.) conceptualizes adult education as a process of self-directed learning in which adults take responsibility for their own learning, drawing upon their experiences to acquire new knowledge and skills. National Open University of Nigeria (2012) describes adult education as a lifelong learning process designed to provide functional literacy, vocational skills, and continuing education opportunities for adults outside the formal school system. International Council for Adult Education (2018) viewed adult education as a tool for empowerment that enables adults to participate actively in social, economic, and political life through continuous learning.

Adult education is the learning activities engaged in by adults beyond traditional schooling; it helps adults gain new attitudes, knowledge, skills, or values through structured educational processes. Adult learning and education (ALE) is a comprehensive approach that includes literacy, continuing education, and community education aimed at equipping adults with the capabilities to think critically, act with autonomy, and participate in sustainable development. Adult education is a special education designed for the masses who are not literate. Adult education is one of the educational system of Nigeria that is very important in aiding social, economic and technological development. Adult education is grouped among the mass education or literacy programme in Nigeria. Funmilola & Peter (2018) submitted that providing literacy programmes for these youths and adults will also help in improving the economic condition of the country as well as serving as an impetus to sustainable development in the long run. This is because the empowered youths and adults will be able to contribute positively to the growth of the economy instead of reverting



to different sorts of crimes or begging. To build a society that is self-sufficient requires the mobilization of the uneducated, the poor and underdeveloped, many of whom have untapped potentials; and if they are fully developed will be of immense benefit not only to themselves but to the nation as a whole. This is evident when one considers the objectives of setting up literacy programmes and how they are relevant to sustainable development of any nation (Ozoemena, 2013).

- **Concept of Artificial Intelligence**

John McCarthy, who coined the term, defined artificial intelligence as the science and engineering of making intelligent machines, especially computer programs capable of performing tasks that require human intelligence. Artificial Intelligence is broadly defined as a field of study focused on creating systems that can simulate human intelligence processes such as learning, reasoning, perception, and decision-making. Oxford University Press (2023) viewed artificial intelligence as the theory and development of computer systems able to perform tasks that normally require human intelligence, including visual perception, speech recognition, and language translation. IBM describes artificial intelligence as the capability of a computer system to imitate intelligent human behavior by using algorithms, data, and computational power to solve problems and make decisions. Artificial intelligence is the branch of computer science focused on designing machines and systems that can perform tasks typically requiring human intelligence such as learning, reasoning, problem-solving, and language understanding. AI refers to machines programmed to imitate aspects of human intelligence, including learning, perception, reasoning, and problem-solving.

Artificial intelligence is one of the educational resources that has assisted in the delivery of teaching and learning in the schools system. Integrating AI into education offers many benefits, it also poses important considerations and potential challenges. Ethical concerns about privacy, data security, and algorithmic bias must be considered to ensure responsible and fair use of AI in the classroom. In addition, training and professional development programs are needed to equip educators with the skills and knowledge to effectively leverage AI tools and platforms. It is important to find a balance between the use of AI technology and the essential role teachers play in fostering creativity, critical thinking, and social-emotional skills. Bringing AI into the classroom has the potential to revolutionize education globally. Educators can use the power of AI to personalize learning, automate administrative tasks, create rich learning experiences, and deliver intelligent learning systems. However, careful attention should be paid to ethical considerations and teacher training to ensure responsible and fair behavior (Sharma, Tomar, Bhardwaj, & Sakalle, 2021; Bojorquez & Vega, 2023).



4.2. Impact of Artificial Intelligence on Adult Education in Nigeria

Artificial intelligence (AI) is increasingly reshaping how education is designed, delivered, and experienced across the world. In Nigeria, where adult education plays a vital role in literacy, skill development, and lifelong learning, AI is creating both opportunities and challenges. The following sections explore the key impacts of AI on adult education in Nigeria in detail.

❖ Enhancing Access to Learning Opportunities

The use of Artificial Intelligence (AI) has been significantly increasing in various fields, including education. In Nigeria, adult education has been facing numerous challenges, which hinder access to learning opportunities. The integration of AI in the educational sector has proven to be effective in enhancing access to learning opportunities. In this academic abstract, we discuss how AI is improving access to learning opportunities in adult education in Nigeria. AI technology has the potential to enhance the overall learning experience for adult learners in Nigeria. Through the use of AI-based tools, institutions can provide personalized learning content tailored to the individual's needs, learning style, and pace (Ogunode, & Gregory, 2023).. This allows adult learners to have a more engaging and effective learning experience, ultimately improving their access to learning opportunities. AI-based chatbots are being used to provide instant and accurate responses to inquiries from adult learners (. This not only saves time but also helps to bridge the communication gap between learners and educators. With AI, adult learners have access to round-the-clock support, making their learning journey more convenient and accessible. One of the most significant impacts of AI in adult education is its ability to expand access to learning beyond traditional classrooms. In Nigeria, many adults are unable to attend formal classes due to work, family responsibilities, or geographic limitations. AI-enabled platforms such as mobile learning applications, chatbots, and virtual tutors allow learners to access educational content anytime and anywhere. For example, mobile apps powered by AI can adapt content delivery to the learner's pace and schedule, making learning flexible for people with irregular working hours. Rural learners who may not have easy access to adult education centers can use AI systems on their phones or basic computers to engage in literacy, numeracy, or vocational training. By reducing the dependency on physical infrastructure, AI helps bridge geographical divides and brings learning directly to adults in local communities (Ogunode & Olowonefa 2023)..

❖ Personalized Learning Experiences

The use of artificial intelligence (AI) in personalized learning experiences has greatly impacted adult education in Nigeria. Through the development of AI-powered learning platforms and tools,



adult learners are able to receive personalized instruction and tailored content based on their individual needs and preferences. This has led to a significant improvement in the overall learning outcomes and engagement of adult learners in Nigeria, as the use of AI allows for more efficient and effective delivery of educational content (Zarrouqi, Riyad & Falta, Amira 2020). AI-powered learning experiences in adult education have also helped to bridge the gap in access to quality education, especially for those in remote or underprivileged areas. By analyzing user data and behavior, AI can identify knowledge gaps and adapt learning materials to meet the specific needs of adult learners in Nigeria (Ogunode, Idoko & ThankGod , 2024). This not only enhances the learning experience, but also promotes lifelong learning and continuous improvement. Furthermore, AI-powered learning experiences have also enabled the creation of personalized assessments, providing learners with immediate feedback and progress tracking. This promotes a sense of accountability and motivation for adult learners in Nigeria. Adult learners have diverse backgrounds, experiences, and learning needs, and traditional educational methods often fail to accommodate this diversity (Westagilelabs 2022). AI tools can analyze learners' strengths and weaknesses and tailor the learning process accordingly. In Nigeria, AI systems can assess individual performance in real time and provide customized recommendations. For instance, if a learner struggles with a particular topic, the system can offer more practice exercises or alternative instructional strategies. This personalized approach increases engagement because adults receive support that matches their unique learning styles. In contrast to one-size-fits-all approaches, AI helps make adult education more responsive and learner-centered (UNESCO, n.d.).

❖ **Automating Assessment and Feedback**

Artificial Intelligence (AI) has been increasingly utilized in the field of education, with a focus on adult education in Nigeria. This technology has the potential to greatly impact the assessment and feedback process, making it more efficient and accurate. AI can automate the assessment process by analyzing data and providing insights on student progress and performance. This includes identifying areas where students may be struggling and providing personalized recommendations for improvement. With AI, the assessment process can be done in real-time, thereby providing immediate feedback to students. AI can also automate the feedback process by analyzing student work and providing detailed feedback (Igbokwe, 2023). This can include identifying grammatical errors, suggesting improvements to writing style, and providing tips for better organization of ideas. With AI, feedback can be provided to students in a timely manner, without the need for human intervention. In the context of adult education in Nigeria, where resources and access to education may be limited, AI can play a crucial role in providing high-



quality assessment and feedback to students. This can help bridge the gap between traditional and modern methods of education and make learning more accessible and effective for adult learners. The use of AI in the assessment and feedback process can also free up educators' time, allowing them to focus on other important aspects of teaching such as lesson planning and providing individualized support to students (Ogunode, & Ukozor, 2023). This can ultimately lead to a more efficient and effective education system in Nigeria. Assessment plays a crucial role in adult education by measuring progress and guiding improvement. However, in resource-limited settings like many parts of Nigeria, regular and timely assessment can be difficult due to a shortage of trained instructors and limited classroom time. AI tools can automate many aspects of assessment, including quizzes and monitoring of learning outcomes. Through natural language processing and machine learning, AI systems can grade written responses, provide instant feedback, and identify areas where learners need further support. This immediate feedback loop motivates learners and allows them to make adjustments continuously rather than waiting weeks for results. It also frees educators from routine grading tasks, allowing them to focus on mentoring and higher-level support (UNESCO Institute for Lifelong Learning, 2015).

❖ **Supporting Instructors and Administrators**

AI does not simply benefit learners it also supports teachers and adult education administrators. In Nigeria, educators often face heavy workloads and limited professional development opportunities. AI tools can assist instructors by generating teaching resources, analyzing class performance, and identifying topics that need reinforcement. For example, AI can analyze data from multiple (Frankenfield, 2023) learners to show patterns of difficulty or mastery, enabling teachers to adjust their instruction strategically. Administrators can also use AI to optimize scheduling, monitor attendance, and evaluate program effectiveness. By reducing administrative burden, AI helps educators devote more time to pedagogical planning and personalized support.

❖ **Promoting Digital Literacy and 21st-Century Skills**

The integration of AI into adult education also exposes learners to digital technologies, which themselves are valuable skills in the modern workforce. In Nigeria, many adult learners enter the education system with limited experience using computers or mobile apps beyond basic communication. Interaction with AI-driven platforms helps adults build confidence with technology, improve digital literacy, and develop skills that are increasingly demanded in employment markets. This focus on digital competence contributes not only to educational outcomes but also to economic inclusion, as learners become better equipped for technology-enhanced workplaces (Copeland, 2022).



❖ Reducing Education Costs Over Time

While the initial investment in AI technology may be high, AI has the potential to reduce costs in the long term by improving efficiency. Traditional adult education often requires physical classrooms, printed materials, and continuous instructor presence all of which involve ongoing expenses (Ogunode, Agbade, & Bassey, 2023b). AI-assisted systems can deliver content digitally, adapt resources automatically, and scale learning to larger audiences without proportional increases in cost. In Nigeria, where education budgets are constrained, AI systems can help governments and institutions stretch limited resources further, reaching more adult learners without exponential cost increases (Bojorquez, & Vega, 2023).

4.3. Conclusion and Recommendations

Artificial intelligence has the potential to revolutionize adult education in Nigeria by addressing long-standing challenges and creating innovative learning opportunities. Through AI-powered platforms, adult learners can access flexible, personalized, and interactive learning experiences, while educators and administrators benefit from automated assessment, data-driven insights, and reduced administrative burden. AI also fosters digital literacy, equipping adults with the skills necessary for the modern workforce. However, the successful implementation of AI in adult education is contingent upon overcoming barriers such as limited internet access, digital literacy gaps, ethical concerns, and the need for culturally appropriate learning content. When these challenges are addressed, AI can significantly enhance the effectiveness, efficiency, and inclusivity of adult education programmes in Nigeria.

Based on the analysis of AI's impact on adult education in Nigeria, the following recommendations are proposed:

- 1) Invest in Digital Infrastructure:** Government and educational institutions should prioritize reliable internet access and affordable devices to bridge the digital divide, particularly in rural and underserved areas.
- 2) Capacity Building for Educators and Learners:** Regular training programs should be implemented to enhance digital literacy and equip adult educators and learners with the skills needed to effectively use AI-based learning platforms.
- 3) Develop Culturally Relevant AI Content:** Learning materials should be tailored to local languages, contexts, and cultural norms to ensure relevance and engagement among Nigerian adult learners.



4) Establish Policies on Data Privacy and Ethics: Clear guidelines should be developed to safeguard learner data and promote ethical use of AI technologies in adult education.

5) Encourage Public-Private Partnerships: Collaboration between government, technology companies, and educational institutions can support the sustainable development and scaling of AI-driven adult education programmes.

6) Promote Research and Innovation: Continuous research on AI applications in adult education should be encouraged to identify best practices, assess outcomes, and adapt technologies to Nigeria's unique educational needs.

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Concluding Synthesis

The second edition of *Sustainable Education in Africa* advances the discourse on educational transformation by offering a deeper, more nuanced interrogation of the structural, technological, and socio-economic forces shaping education systems across Nigeria and the African continent. Building upon the foundations established in the first edition, this volume expands its analytical scope to incorporate emerging paradigms such as digital ecosystems, artificial intelligence–driven educational planning, climate-responsive education, and the evolving nexus between education, economic resilience, and sustainable development.

A cross-chapter synthesis reveals that sustainable education in Africa is no longer a singular policy objective but a dynamic, multi-layered process requiring systemic alignment across governance, infrastructure, pedagogy, and innovation ecosystems. The contributions collectively underscore that while technological advancements—particularly in digital learning platforms, data analytics, and artificial intelligence—offer unprecedented opportunities to enhance access, efficiency, and quality, their transformative potential remains contingent upon enabling environments characterized by robust infrastructure, policy coherence, institutional capacity, and equitable resource distribution.

The volume further highlights the persistence of entrenched structural challenges, including chronic underfunding, socio-economic inequalities, policy inconsistencies, insecurity, and weak institutional frameworks. These constraints continue to limit the scalability and sustainability of educational reforms. Notably, the second edition places greater emphasis on the interconnectedness of these challenges, illustrating how deficits in governance, economic stability, and social inclusion directly impact educational outcomes.

Importantly, this edition reframes education as a strategic driver of national competitiveness, innovation, and social cohesion within a rapidly changing global landscape. It reinforces the imperative for education systems to move beyond traditional models toward adaptive, inclusive, and future-oriented frameworks that are responsive to both global trends and localized realities.

Ultimately, this volume contributes to advancing scholarly and policy-oriented conversations by offering integrated insights that bridge theory, practice, and innovation. It serves as a critical resource for stakeholders seeking to navigate the complexities of educational transformation while fostering systems that are resilient, inclusive, and aligned with sustainable development imperatives.

Implications for Practice

Drawing from the expanded insights of this second edition, the following strategic implications are proposed for policymakers, educational leaders, practitioners, and development partners:

Policy Innovation and Systems Thinking:

Governments should adopt adaptive, data-driven policy frameworks that integrate sustainability, digital transformation, and inclusivity into long-term national development strategies. Emphasis should be placed on policy continuity, monitoring mechanisms, and cross-sectoral coordination.

Digital Transformation and Emerging Technologies:

There is an urgent need to scale investments in digital infrastructure, artificial intelligence applications, and smart learning environments. Educational systems must harness technology not only for access but also for personalized learning, predictive planning, and administrative efficiency.

Sustainable Financing Models:

Beyond traditional funding mechanisms, innovative financing approaches—including public-private partnerships, education bonds, and international development funding—should be explored to ensure long-term sustainability and resilience of education systems.

Capacity Development for the Future Workforce:

Continuous professional development must evolve to include digital competencies, interdisciplinary teaching approaches, and innovation-driven pedagogy. Educators should be equipped to prepare learners for emerging global labor markets.

Equity, Inclusion, and Social Justice:

Policies and interventions must go beyond access to address systemic inequalities affecting marginalized groups, including gender disparities, rural-urban divides, and learners with special needs. Inclusive education should be embedded as a core principle rather than a peripheral objective.

Research, Data, and Evidence-Based Practice:

Institutions should strengthen research capacity and promote the use of real-time data analytics to inform decision-making, policy formulation, and educational innovation.

Strengthening Institutional Resilience:

Education systems must be designed to withstand disruptions such as economic shocks, pandemics, and conflicts by incorporating flexible delivery models, blended learning systems, and crisis-responsive policies.

Multi-Stakeholder Collaboration:

Sustainable transformation requires coordinated engagement among governments, academia, industry, civil society, and international organizations to leverage expertise, resources, and innovation.

Editors' Note

The editors are pleased to present the second edition of *Sustainable Education in Africa*, which reflects an expanded and enriched body of knowledge responding to the evolving complexities of education systems within the continent.

We extend our sincere appreciation to the contributing authors whose scholarly contributions demonstrate exceptional rigor, depth, and forward-thinking perspectives. Their work not only builds upon the foundations of the first edition but also introduces new dimensions that address contemporary challenges and emerging opportunities in education.

We also acknowledge the invaluable role of peer reviewers, editorial board members, and institutional collaborators whose commitment to academic excellence has ensured the credibility, relevance, and quality of this publication. Their contributions have been instrumental in shaping this volume into a comprehensive and impactful resource.

This second edition is conceived as more than an academic compilation; it is a strategic platform for advancing dialogue, informing policy, and inspiring innovation in education across Africa. It reflects our collective commitment to fostering educational systems that are inclusive, resilient, and aligned with sustainable development goals.

It is our expectation that this volume will serve as a catalyst for further research, interdisciplinary collaboration, and transformative action, ultimately contributing to the continuous evolution of education systems across the continent.