

ARTIFICIAL INTELLIGENCE AND NATIONAL DEVELOPMENT: IMPLICATIONS FOR ADULT EDUCATION IN THE 21ST CENTURY

Asso. Prof. Gyot Bitrus Dambo

Department of Educational Management
Federal University of Education, Pankshin, Plateau State, Nigeria
email: gyotbitrus1@gmail.com
08035905145

Nurudeen Rasaq Ayinla

Federal University of Education, Pankshin, Plateau State, Nigeria
email: nurudeen01@gmail.com

Basara Grace Yohanna

Department of Science Laboratory Technology, Plateau State Polytechnic Barkin-Ladi
email: gracebasara@gmail.com

ABSTRACT

Artificial Intelligence (AI) has emerged as one of the most transformative forces shaping contemporary societies and national development agendas. Governments across the globe are increasingly deploying AI-driven technologies to enhance economic productivity, governance efficiency, healthcare delivery, and educational access. However, the extent to which nations benefit from AI innovations largely depends on the preparedness of their human capital, particularly adults who constitute the core of the workforce and civic population. This paper examines the relationship between artificial intelligence, adult education, and national development in the 21st century. Adopting a qualitative literature review approach, the study analyzes recent scholarly works, policy documents, and global development reports to explore how AI can enhance adult literacy, lifelong learning, workforce upskilling, and national productivity. Findings reveal that AI-powered tools such as adaptive learning platforms, intelligent tutoring systems, learning analytics, and digital assistants have significant potential to expand access to adult education, personalize learning experiences, and address skills mismatches in the labor market. Nonetheless, challenges including digital illiteracy, infrastructural deficits, ethical risks, data privacy concerns, and socioeconomic inequalities threaten the equitable adoption of AI in adult education. The paper recommends among others the integration of AI competencies into adult education curricula, increased investment in digital infrastructure, strengthened regulatory and ethical frameworks, and the promotion of inclusive digital literacy initiatives.

Keywords: Artificial Intelligence, adult education, national development.

INTRODUCTION

Artificial Intelligence (AI) has become a defining feature of the 21st century knowledge economy, influencing how societies work, learn, communicate, and govern. From automated decision-making systems to intelligent data analysis, AI technologies are reshaping industries and redefining the skills required for meaningful participation in national development. As nations pursue economic growth, social inclusion, and global competitiveness, the role of education

especially adult education has become increasingly critical.

Adult education occupies a strategic position in national development because it targets individuals who are already active in the workforce, governance structures, and community life. In many developing countries, including Nigeria, a large proportion of adults missed formal education opportunities or possess skills that are rapidly becoming obsolete due to technological change. Consequently, aligning adult education with AI-driven development strategies is essential for bridging skill gaps, enhancing productivity, and promoting inclusive growth.

This paper explores how artificial intelligence can support adult education and, by extension, contribute to national development. It situates the discussion within contemporary debates on lifelong learning, digital transformation, and human capital development, arguing that adult education must evolve to remain relevant in an AI-driven world.

CLARIFICATION OF CONCEPTS

Artificial Intelligence: Nwafor (2024) observes that: AI is the intelligence associated to machinery. Furthermore, AI simply refers to the ability of machines to mimic human intelligence through tasks like reasoning, learning and problem-solving (Kumar, 2022). AI also refers to the ability of machines and computer systems to perform tasks that typically require human intelligence, including learning, reasoning, problem-solving, language processing, and decision-making. AI technologies encompass machine learning algorithms, natural language processing tools, robotics, and data-driven predictive models. In the context of education, AI is increasingly applied to personalize learning experiences, automate assessment and grading, provide real-time feedback, and support adaptive instruction (Luckin et al., 2022). In Nigeria, these applications have the potential to enhance adult education, vocational training, and lifelong learning by addressing challenges such as large class sizes, limited access to qualified instructors, and regional disparities in educational resources.

Adult education: According to Halilu (2018) Adult education is a cultural programme that embrace the condition that favour a responsible adaption to the medium, a critical interaction with the media, the training or decision making, social participation and something more than just material gain. The UNESCO white paper on Adult education (2000) earlier defines adult education as a systematic learning undertaken to return to learning having concluded initial or training or having realize need for knowledge socialization. Adult education encompasses organized learning activities designed for individuals beyond the traditional school age. It includes adult literacy programs, continuing education, vocational and technical training, professional development, and lifelong learning initiatives. The primary aim of adult education is to equip learners with knowledge, skills, and attitudes that enhance personal growth, employability, civic engagement, and social inclusion (UNESCO, 2022). In the Nigerian context, adult education plays a critical role in addressing high levels of adult illiteracy, bridging skills gaps, promoting workforce readiness, and supporting inclusive socio-economic development across diverse regions and communities.

Rodney, (1972) observes that development in human society is a many sided process; at the level of the individual, it implies increase skill and capacity, greater freedom, creativity, self-discipline, responsibility and material well-being... and at the level of social groups, development implies an increasing capacity to regulate both internal and external relationships.

National Development: is thus process of growth, improvement, or advancement whether in personal economic or technical context. Development simply means evaluation, physical growth, and maturity expansion, enlargement, spread, built out, progress success blossoming and headway. Furthermore, national development refers to the overall improvement in the economic, social, political, and technological well-being of a country. It encompasses human capital development,

economic growth, poverty reduction, social equity, and the sustainable use of resources. Education, particularly adult education, plays a central role in national development by enhancing workforce competence, promoting innovation, and fostering civic and democratic participation as been conversed for in this paper. In Nigeria, adult education is especially critical for addressing regional disparities, equipping citizens with practical skills for employment and entrepreneurship, and supporting inclusive socio-economic growth that contributes to sustainable national development.

ARTIFICIAL INTELLIGENCE AND ADULT EDUCATION

The integration of artificial intelligence (AI) into adult education marks a shift from traditional, uniform approaches to more flexible, learner-centered models. AI-powered platforms can adapt instructional content to the individual needs, pace, and learning styles of adult learners, making education more accessible to those with diverse backgrounds, work commitments, and personal responsibilities. Intelligent tutoring systems, for instance, provide personalized guidance and real-time feedback, enabling learners to progress independently while receiving targeted support. AI-driven learning analytics can also identify knowledge gaps, recommend tailored interventions, and monitor learner performance, thereby improving outcomes and reducing dropout rates (Holmes et al., 2023).

Furthermore, AI facilitates lifelong learning by supporting continuous skills development through online, hybrid, and mobile learning environments. This capability is particularly critical in Nigeria, where rapid technological and economic changes demand constant reskilling and upskilling of the adult workforce to meet labour-market needs, enhance employability, and promote national development. By integrating AI into adult education systems, Nigeria can expand access to quality learning, address skill gaps in various sectors, and empower citizens to contribute effectively to sustainable socio-economic growth.

IMPLICATIONS OF AI FOR NATIONAL DEVELOPMENT

AI-enhanced adult education can play a crucial role in improving workforce readiness by aligning learning programs with current and emerging labor market demands. AI-powered digital platforms enable adults to acquire in-demand skills in fields such as data analysis, digital marketing, software development, entrepreneurship, and other technology-driven sectors. In the Nigerian context, where youth unemployment and skill gaps remain significant challenges, such targeted learning can increase employability, foster innovation, and boost productivity across both formal and informal sectors. By equipping adult learners with relevant competencies, AI-supported education contributes directly to human capital development and supports broader national economic growth and competitiveness (World Economic Forum, 2024).

When effectively implemented, AI has the potential to expand access to adult education for marginalized populations, including rural communities, women, persons with disabilities, and workers in the informal sector. Mobile learning applications, voice-based AI tools, and multilingual platforms can support adult literacy and skills acquisition in local Nigerian languages, bridging barriers to learning for those with limited formal education. By promoting inclusive and equitable learning opportunities, AI not only enhances individual empowerment but also strengthens social cohesion and supports broader national development goals.

Also, AI-literate adults are better equipped to navigate digital governance platforms, access public services, and participate actively in democratic processes. In Nigeria, where e-governance and digital service delivery are expanding, adult education programs that integrate AI competencies can enhance civic engagement, promote accountability, and strengthen institutional efficiency. By fostering both technological literacy and informed participation, AI-supported adult learning contributes not only to individual empowerment but also to the development of a more responsive and inclusive democratic society.

CHALLENGES IN ADOPTING AI IN ADULT EDUCATION

Despite its significant potential, the adoption of AI in adult education faces several challenges in Nigeria and other developing countries. Digital illiteracy remains widespread among adult learners, limiting their ability to engage effectively with AI-powered learning platforms. In addition, inadequate access to electricity, internet connectivity, and affordable digital devices constrains the widespread implementation of AI-enabled education, particularly in rural and underserved areas.

Religious bodies further compounded the problems of AI acceptability citing confusion and confrontation with their initial orientation alleging that the whole idea of AI set to challenge God's Will' hence they frown at its acceptability and application,

Ethical and governance concerns also complicate AI adoption. Issues such as data privacy, algorithmic bias, and excessive surveillance raise critical questions about the responsible and equitable use of AI in education. Without robust policy frameworks, ethical guidelines, and regulatory oversight, AI technologies risk reinforcing existing educational and socio-economic inequalities rather than promoting inclusion and empowerment (UNESCO, 2023). Addressing these challenges is therefore essential for ensuring that AI contributes positively to adult learning and sustainable national development in Nigeria.

METHODOLOGY

This study adopts a qualitative literature review approach to examine the application of artificial intelligence (AI) in adult education within the Nigerian context and its implications for national development. Relevant peer-reviewed journal articles, policy documents and reports from reputable international organizations such as UNESCO, the OECD, and the World Economic Forum were systematically reviewed, alongside Nigerian education policy documents and related studies.

The reviewed literature was selected based on its relevance to AI, adult and lifelong learning, skills acquisition, and workforce development in Nigeria. The analysis employed thematic content analysis to identify key themes such as AI-driven personalized learning, digital inclusion, adult skills development, and policy challenges in Nigeria. The synthesized findings provided insights into how AI-supported adult education can enhance human capital development and contribute to sustainable national development in Nigeria.

DISCUSSION

The review indicates that artificial intelligence (AI) has significant potential to transform adult education by enhancing accessibility, flexibility and relevance to contemporary economic and labour-market needs. Through adaptive learning platforms, mobile technologies and data-driven instructional systems, AI can support personalized learning experiences for adult learners, including workers, unemployed youths, and adults in rural and underserved communities. This is particularly relevant in Nigeria, where adult education is essential for addressing skills gaps, unemployment and the demands of lifelong learning in a rapidly changing economy.

However, the effective implementation of AI-driven adult education in Nigeria depends on the availability of supportive policy frameworks, like the policy document on education sustained investment in digital infrastructure and continuous capacity building for educators and learners. To maximize these benefits, government and education stakeholders should prioritize the integration

of AI into national adult and lifelong learning policies, expand affordable internet access and digital learning facilities, and strengthen public private partnerships to support innovation in adult education. In addition, targeted training programmes should be provided to equip adult educators with AI-related pedagogical and technical skills, while digital literacy initiatives should be expanded to ensure inclusive participation among adult learners.

Countries that strategically integrate AI into lifelong learning systems through coherent policies, adequate funding, and stakeholder collaboration are better positioned to enhance human capital development, promote sustainable national development, and improve global competitiveness.

SUGGESTIONS

1. Adult education curricula should be revised to incorporate AI literacy and digital competencies that equip learners with relevant skills for the modern workforce. This will enhance adaptability, employability, and lifelong learning, enabling adults to respond effectively to technological changes in the labour market.
2. Governments should prioritize investment in reliable digital infrastructure, including broadband connectivity, learning management systems, and community learning centres, to ensure equitable access to AI-enabled adult education, particularly for learners in rural and underserved areas and general funding upgraded.
3. Ethical guidelines and regulatory frameworks should be strengthened to guide the responsible use of AI in education. This includes safeguarding data privacy, preventing algorithmic bias, and ensuring transparency and accountability in the deployment of AI technologies for adult learning.
4. Adult educators should receive regular training and professional development in AI-supported teaching and learning methods. Such capacity-building initiatives will enhance educators' ability to effectively integrate AI tools into instruction and support learner engagement and outcomes.

CONCLUSION

Artificial intelligence presents both significant opportunities and challenges for adult education and national development in Nigeria. When strategically integrated, AI can improve adult learning outcomes, expand access to education for underserved populations, enhance workforce skills, and promote economic empowerment. However, realizing these benefits in Nigeria requires addressing challenges such as inadequate digital infrastructure, limited internet access, low digital literacy among adult learners, and insufficient training for educators. Aligning AI strategies with Nigeria's National Policy on Education and other relevant adult and lifelong learning frameworks is therefore essential for strengthening human capital, fostering innovation, and building resilient, future-ready societies that can drive sustainable national development and global competitiveness has been advocated for in this paper.

REFERENCES

- Auwalu, H. (2018). *Fundamental of philosophy of adult and non-formal education*. Kano: Maigishiri Gabasawa Press and Ventures.
- Holmes, W., Bialik, M., & Fadel, C. (2023). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.
- Kumar, A. (2022). *Artificial intelligence in higher education leaving technology* (Vol. 1). Rutledge. <https://doi.org/10.1016/j.jclepro.2022.126250>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2022). *Intelligence unleashed: An argument for AI in education*. Pearson.
- OECD. (2023). *Education and AI: Preparing teachers and learners for the future*. OECD Publishing.
- Okey, K. N. (2025). Philosophy, artificial intelligence and digital education. *Nigeria Journal of Education Philosophy (NJEP)*, 35(1).
- Oxford University Press. (2004). *Oxford thesaurus of English* (2nd ed.). Clowes Baccels, Suffolk.
- UNESCO. (2022). *Reimagining lifelong learning in the age of digital transformation*. UNESCO Publishing.
- UNESCO. (2023). *Guidance on generative AI in education and research*. UNESCO.
- Walter, R. (1972). *How Europe underdeveloped Africa* (Introduction by V. Harding). Panat Publishing, Inc.
- World Bank. (2024). *Digital skills for inclusive growth*. World Bank Publications.
- World Economic Forum. (2024). *The future of jobs report*. WEF.