

Artificial Intelligence and Research Capacity Among Women in Adult and Non-Formal Education in Nigeria: A Position Paper on Opportunities and Constraints

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ABSTRACT

Artificial intelligence is increasingly reshaping educational research worldwide by improving efficiency, analytical depth, and research quality. However, its application remains uneven across educational sectors, among women in Adult and Non-Formal Education receiving limited empirical attention, particularly in low-resource contexts such as Nigeria. This position paper examines the opportunities and constraints associated with the use of artificial intelligence for strengthening research capacity within these marginalised education sectors. Drawing on existing empirical and theoretical literature, the paper explores current patterns of AI use, assesses its contribution to research quality and efficiency, and analyses the institutional, infrastructural, ethical, digital access, and gender-related challenges shaping AI adoption. Guided by digital divide theory and gender-technology perspectives, the analysis highlights how weak infrastructure, limited institutional support, low digital literacy, and persistent gender inequalities restrict meaningful engagement with AI-enabled research tools. The paper argues that while artificial intelligence holds significant potential to enhance research accuracy, productivity, and policy relevance, its benefits cannot be realised without context-sensitive, inclusive, and ethically grounded strategies. Thus, centering on women in Adult and Non-Formal Education in the discussion, this paper repositions these sectors as analytically important to global debates on artificial intelligence and research development. It contributes to educational research by offering a grounded perspective from Nigeria and by advancing a clear call for targeted interventions that align technological innovation with local educational realities and equity concerns.

Keywords: Artificial Intelligence, Research Capacity, Women in Education, Adult Education, Non-Formal Education, Nigeria

INTRODUCTION

Artificial intelligence (AI) has become a powerful force shaping research practices in education globally. Over recent years, educational research has gradually moved from manual, labour-intensive approaches towards the use of advanced AI-powered tools, including natural language processing and large language models. These tools now support essential research activities such as systematic literature searches, large-scale data analysis, pattern recognition, and the production of more accurate and timely findings (Chen et al., 2020; Zawacki-Richter et al., 2019). Since the mid-2010s, the rapid growth of AI in educational research reflects its increasing importance for knowledge production, innovation, and operational efficiency, particularly within higher education systems (Guo et al., 2024). AI has also improved how researchers manage complex information, optimise time use, and generate more reliable outputs, making research processes more systematic and evidence-driven (Bozkurt et al., 2021). However, these advances are accompanied by ongoing concerns regarding ethics, data privacy, and algorithmic bias, which require careful and responsible application (Bond et al., 2024). Collectively, these

developments position AI as a central pillar of modern educational research and provide a conceptual foundation for examining its role in specific contexts.

Despite this global momentum, AI research has often overlooked adult, non-formal, and women-centred education. These areas are crucial for promoting literacy, skills development, and social empowerment, especially among rural women and out-of-school adults. Such educational programmes strengthen practical knowledge, self-confidence, and community participation, contributing to broader social and economic development (Akpala, 2018; Yusuf, 2023). Yet, research and AI adoption in these sectors remain limited. Structural challenges such as low funding, inadequate institutional support, and substandard learning environments constrain the effectiveness of programmes and limit opportunities for evidence-based improvements (Dosunmu, 2020; Mkpa et al., 2023). This marginalisation highlights without focused attention, AI's potential to enhance research in these contexts is unlikely to be realised.

The Nigerian context is analytically significant for exploring these issues. Women in Adult and Non-Formal Education in Nigeria face persistent challenges related to limited resources, infrastructure, and research capacity. While global studies demonstrate AI's potential to improve research quality, efficiency, and analytical rigour, its use in Nigeria's adult and non-formal education sector is still emerging, often confined to pilot initiatives and isolated institutional efforts (Ocen et al., 2025; Yusuf et al., 2024). Examining AI adoption in Nigeria provides valuable insight into how global technological trends intersect with local realities, including resource constraints, institutional weaknesses, and socio-cultural dynamics.

This paper argues that AI presents both significant opportunities and notable constraints for research development in Nigeria's women in Adult and Non-Formal Education sectors. While AI can enhance research accuracy, efficiency, and productivity, its benefits depend on careful attention to institutional readiness, ethical practices, digital access, and gender-related challenges. The paper aims to: explore how AI tools are currently used in research, assess their contribution to research quality and efficiency, identify institutional and infrastructural barriers, and examine ethical, digital, and gender-related limitations to AI adoption. In doing so, it seeks to reposition women in Adult and Non-Formal Education as central rather than peripheral to global discussions on AI and research capacity, highlighting the importance of context-sensitive approaches that bridge technological innovation with local educational realities.

Statement of the Problem

Despite the increasing global use of artificial intelligence to improve research quality and efficiency among women in Adult and Non-Formal Education in Nigeria continue to experience limited access to and use of these tools. This situation directly affects the ability of educators and practitioners in these sectors to conduct timely, credible, and relevant research. Many lack the required skills, institutional support, and infrastructure to adopt AI for research activities, while existing inequalities further restrict participation and innovation. In addition, there is limited empirical understanding of how AI can be meaningfully integrated into research practices within these learning contexts, as current discussions largely focus on formal and higher education. As a result, the potential role of AI in strengthening research capacity, improving evidence-based decision making, and supporting inclusive educational development remains underexplored. The problem this study addresses is the gap between the potential benefits of AI for research and its actual use, readiness, and applicability among women in Adult and Non-Formal Education in Nigeria.

Research Objectives

- i. To examine how artificial intelligence tools are currently used to support research activities among women in Adult and Non-Formal Education in Nigeria.
- ii. To assess the contribution of artificial intelligence to improving research quality and efficiency among women in Adult and Non-Formal Education contexts.

- iii. To identify institutional and infrastructural barriers affecting the use of artificial intelligence for research development among women in Adult and Non-Formal Education in Nigeria.
- iv. To identify ethical, digital access, and gender-related challenges limiting the effective adoption of artificial intelligence for research among women in Adult and Non-Formal Education.

Theoretical and Conceptual Orientation

This study is anchored in the intersection of digital divide theory and gender-technology perspectives, providing a framework to examine the uneven access, utilisation, and impact of artificial intelligence (AI) in educational research. Digital divide theory propounded by Van Dijk posits that disparities in access to technology, skills, and usage can reinforce existing social and educational inequalities (Ragnedda, & Muschert, 2013). Applied to the Nigerian context, this framework helps explain how infrastructural limitations, low digital literacy, and socio-cultural barriers restrict researchers' capacity to adopt AI among women in Adult and Non-Formal Education (Suleiman et al., 2023; Sufian et al., 2023).

Complementing this, gender-technology perspectives emphasise the ways in which social norms and structural inequalities influence women's participation in technological and research environments (Aguboshim et al., 2022). These perspectives are critical for understanding the gendered dimensions of AI adoption, including access to digital tools, representation in research technology development, and the ability to leverage AI for knowledge production. Together, these theoretical lenses provide a robust conceptual foundation for analysing how AI can enhance research quality and efficiency while accounting for the ethical, gender, and infrastructural challenges that shape educational research in marginalised Nigerian contexts (Samuel et al., 2025; Bozkurt et al., 2021).

DISCUSSION OF FINDINGS

Patterns of Artificial Intelligence Use in Educational Research Practice

The findings indicate that artificial intelligence tools are increasingly embedded in educational research practices globally, yet their application among women in Adult and Non-Formal Education in Nigeria remains limited and uneven. Existing literature shows that AI-driven technologies, particularly natural language processing systems and large language models, are widely used to support literature searching, data coding, pattern recognition, and research reporting in higher education contexts (Chen et al., 2020; Zawacki-Richter et al., 2019; Guo et al., 2024). However, evidence drawn from the Nigerian context suggests that such applications are largely confined to pilot initiatives and isolated institutional efforts among women in Adult and Non-Formal Education.

This pattern reflects a broader structural divide between mainstream higher education research and marginalised educational sectors. While awareness of AI tools is gradually increasing, their systematic integration into research design, data analysis, and reporting remains underdeveloped. This finding underscores the need for deliberate strategies that move beyond awareness towards context-sensitive adoption, ensuring that AI-supported research practices are aligned with the realities of adult and non-formal education environments.

Contributions of Artificial Intelligence to Research Quality and Efficiency

The findings further suggest that artificial intelligence holds substantial potential to enhance both the quality and efficiency of educational research. International evidence demonstrates that AI improves research accuracy and reliability by enabling structured literature reviews, consistent data coding, and detailed textual analysis, thereby reducing errors associated with manual processes (Alqahtani et al., 2023; Chen et al., 2020). In addition, AI-supported analytical tools facilitate the management of large and complex datasets and support the replication of analytical procedures, strengthening the transparency and credibility of research outputs (Paek et al., 2021).

From an efficiency perspective, AI-driven automation of routine tasks such as transcription, data cleaning, and preliminary analysis allows researchers to reallocate time towards interpretation and theoretical engagement (Bozkurt et al., 2021). These benefits are particularly relevant for researchers among women in Adult and Non-Formal Education, who often operate under significant time, resource, and geographical constraints (Mansur et al., 2025). Although Nigeria-specific empirical evidence remains limited, the findings suggest that strategic AI adoption could significantly strengthen research productivity and rigour within this sector, provided that ethical and contextual considerations are adequately addressed.

Institutional and Infrastructural Constraints Shaping AI Adoption

Despite the identified opportunities, the findings highlight persistent institutional and infrastructural barriers that limit effective AI adoption for research development in Nigeria. Inadequate digital infrastructure, unstable internet connectivity, and limited access to advanced technologies continue to constrain research practices, particularly within public institutions and centres serving women in Adult and Non-Formal Education (Luwoye et al., 2024). These challenges are compounded by funding limitations that restrict the acquisition, maintenance, and upgrading of AI-enabled tools, as well as by limited technical expertise among researchers (Festus et al., 2024).

Beyond material constraints, the absence of coherent digital governance structures and fragmented policy frameworks further undermine sustainable AI integration. Limited institutional commitment to research digitalisation and insufficient capacity-building opportunities reduce researchers' ability to engage meaningfully with AI technologies (Samuel et al., 2025). Collectively, these findings suggest that AI adoption cannot be understood solely as a technological issue but must be addressed within broader institutional and policy contexts that shape research capacity and innovation.

Ethical, Digital Access, and Gendered Constraints in AI-Supported Research

The findings also reveal that ethical, digital access, and gender-related challenges significantly shape the adoption of artificial intelligence in educational research. Algorithmic bias, data privacy risks, and unresolved questions around intellectual property ownership emerge as critical concerns, particularly in contexts characterised by weak legal and technical safeguards (Bond et al., 2024; Dhiman et al., 2025). Unequal access to digital infrastructure further determines who benefits from AI-supported research, often disadvantaging under-resourced institutions and rural learning environments (Judijanto et al., 2025).

Gender-related constraints are especially pronounced among women in Adult and Non-Formal Education. Persistent digital gender gaps limit women's access to essential technologies such as mobile devices, reliable internet services, and advanced digital tools required for AI-supported research (Suleiman et al., 2023). These disparities are reinforced by socio-cultural norms and traditional gender roles that restrict women's participation in digital spaces, particularly in rural communities (Sufian et al., 2023). The underrepresentation of women in advanced technological fields further constrains their ability to shape, adapt, and critically evaluate AI tools for research purposes (Aguboshim et al., 2022). The absence of focused empirical studies examining these intersecting challenges highlights a significant knowledge gap and reinforces the need for targeted, gender-responsive research on AI adoption in this educational sector.

Contribution to Knowledge

This study contributes to understanding research practices among women in Adult and Non-Formal Education in Nigeria, highlighting challenges and opportunities in under-resourced educational sectors (Bozkurt et al., 2021; Chen et al., 2020). Empirically, it addresses gaps in evidence regarding research capacity, offering insights on improving accuracy, efficiency, and the overall quality of scholarly work (Mansur et al., 2025; Oyigbo et al., 2021).

Theoretically, the study employs a gender-technology perspective to examine how social norms, structural inequalities, and limited access to resources influence research participation and outputs, providing a framework for understanding equity in educational research (Aguboshim et al., 2022; Suleiman et al., 2023).

Methodologically, it demonstrates a context-sensitive, position-based approach that integrates local realities and ethical considerations, offering a model for future studies seeking to bridge practical challenges with rigorous inquiry (Samuel et al., 2025; Ocen et al., 2025). Overall, the study advances knowledge by combining conceptual clarity, empirical insight, and practical relevance for marginalised education sectors.

CONCLUSION

This paper asserts that artificial intelligence has the potential to transform research practices among women in Adult and Non-Formal Education in Nigeria, yet its current use remains limited and uneven. While AI tools can improve accuracy, efficiency, and analytical depth, their benefits are constrained by inadequate infrastructure, weak institutional support, and persistent gendered digital inequalities. Women researchers and marginalised institutions face the greatest barriers, limiting their ability to fully engage with and benefit from AI-enabled research. The position taken here is that effective, context-sensitive strategies are urgently needed to ensure that AI integration is ethical, inclusive, and tailored to local research needs. Only by addressing these structural and gendered challenges can AI meaningfully enhance research quality, strengthen policy relevance, and contribute to sustainable development in underserved educational sectors.

Suggestions

- i. **Develop AI Skills for Researchers:** Offer practical training programmes for researchers among women in Adult and Non-Formal Education in Nigeria. These programmes should focus on how to use AI tools for planning research, analysing data, and writing reports, helping researchers work more efficiently and confidently.
- ii. **Improve Access to Technology:** Ensure institutions supporting women in Adult and Non-Formal Education have reliable internet, AI tools, and devices. Better technology access will allow researchers to use AI fully and overcome current limitations caused by poor infrastructure.
- iii. **Support Women Researchers:** Create policies that specifically help women researchers, including mentoring, flexible work arrangements, and targeted funding. Supporting women will reduce barriers and enable them to contribute fully to AI-assisted research in these education sectors.
- iv. **Introduce Clear AI Guidelines:** Develop clear rules for using AI in research that protect privacy, prevent bias, and encourage fairness. Ethical and context-sensitive guidelines will make sure AI improves research quality without increasing inequalities.
- v. **Encourage Collaboration and Sharing:** Promote networks between universities, adult learning centres, NGOs, and technology providers. Sharing knowledge, resources, and AI tools will help create research solutions that fit the specific needs of women in Adult and Non-Formal Education in Nigeria.

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