Artificial Intelligence Innovation and Its Influence on Teaching and Learning Effectiveness among Educators and Innovators in Ikot Ekpene Metropolis

Sylvanus P. Idiong, PhD
Department of Educational Foundations
Akwa Ibom state College of Education
Afaha Nsit, Nigeria
Spidiong@gmail.com

Umoessien, U.O.
Department of Science Education
Faculty of Education
Akwa Ibom State University, Nigeria
udyumoessien@gail.com, 07064767377

Obi, Gabriel Osang
Department: Educational Foundations
Unit: Philosophy of Education
University of Calabar, Nigeria
galbymuobi@gmail.com
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Abstract
This study examined the transformative potential of Artificial Intelligence (AI) in revolutionizing teaching and learning within Ikot Ekpene Metropolis, Akwa Ibom State. Despite global advancements in AI-driven education, its application in the study area remains limited due to infrastructural, cultural, and knowledge-related challenges. Anchored on the Technology Acceptance Model (TAM) and the Diffusion of Innovation (DOI) Theory, the study investigated educators' awareness, perceived usefulness, and the influence of infrastructural and socio-cultural factors on AI adoption in education. A mixed-methods research design was employed, combining a descriptive survey of 250 respondents (educators and innovators) with interviews of 10 key informants. Data were analyzed using descriptive statistics, Pearson Product Moment Correlation (PPMC), and multiple regression analysis.
Findings revealed a moderate level of awareness of AI among educators and innovators, but a high perception of its usefulness in enhancing teaching and learning. Results also showed that infrastructural and socio-cultural barriers significantly affect the adoption and integration of AI tools. Furthermore, significant positive relationships were found between AI awareness, perceived usefulness, and adoption levels ($p < 0.05$). The study concludes that Artificial Intelligence has the capacity to transform education in Ikot Ekpene by improving personalization, engagement, and instructional efficiency. However, effective implementation requires targeted capacity building, infrastructural investment, policy formulation, and collaboration between educators and innovators.

Keywords: *Artificial Intelligence, Education, Innovation, Teaching, Ikot Ekpene, Technology Acceptance Model*

Introduction

Education in the 21st century is undergoing a profound transformation driven by technological innovation. Around the world, Artificial Intelligence (AI) is reshaping how teachers teach, how students learn, and how educational systems operate. From intelligent tutoring systems and adaptive learning platforms to automated grading and predictive analytics, AI technologies have become powerful tools for enhancing instructional delivery, personalizing learning experiences, and improving educational outcomes (Luckin, Holmes, Griffiths, & Forcier, 2016). These developments signal a shift toward data-driven, learner-centered education that aligns with the global demand for digital competence and innovation.

In developed countries, the integration of AI into education has already begun to revolutionize teaching and learning. Tools such as AI-powered chatbots, automated feedback systems, and personalized learning analytics have improved both teacher productivity and student performance (Chen, Chen, & Lin, 2020). Through adaptive systems, students can learn at their own pace, while educators can use data insights to identify learning gaps and adjust instructional strategies accordingly. The result is a more efficient, inclusive, and engaging educational process that aligns with 21st-century learning goals.

However, in many developing contexts including Nigeria the application of Artificial Intelligence in education remains in its infancy. Although awareness of AI's potential is growing, its adoption faces numerous challenges such as inadequate infrastructure, lack of technical expertise, cultural resistance, and limited institutional support (UNESCO, 2021; Olanrewaju & Oyelere, 2022). These challenges have hindered the effective utilization of AI-driven tools that could otherwise transform educational practices and bridge existing learning disparities.

Ikot Ekpene Metropolis in Akwa Ibom State represents a microcosm of these challenges and opportunities. The area hosts a vibrant mix of secondary and tertiary institutions as well as emerging innovation hubs. Educators in Ikot Ekpene often grapple with large class sizes, diverse learning abilities, and limited access to digital resources. Innovators, on the other hand, struggle to develop context-specific AI solutions suited to local educational needs (Umoessien, 2024) Yet, there is a growing awareness that Artificial Intelligence could help address these issues by enabling personalized learning, improving efficiency, and supporting inclusive education.

The need to revolutionize learning in Ikot Ekpene through AI therefore arises from the pressing gap between global technological advancement and local educational realities. Understanding educators' awareness, perceptions, and readiness to integrate AI is essential for designing policies and frameworks that foster innovation and sustainability in education. This study, guided by the Technology Acceptance Model (Davis, 1989) and the Diffusion of Innovation Theory (Rogers, 2003), seeks to investigate the awareness, perceived usefulness, and contextual barriers influencing AI adoption among educators and innovators in Ikot Ekpene Metropolis.

By exploring these dimensions, the study aims to contribute to the growing body of knowledge on educational technology integration in developing regions, while providing practical strategies for stakeholders to harness AI effectively. Ultimately, this research envisions a future where education in Ikot Ekpene becomes more adaptive, inclusive, and responsive to the digital demands of the 21st century.

Statement of the Problem

In 2023, a teacher in one of the secondary schools within Ikot Ekpene metropolis faced a familiar challenge. She had over 80 students in her classroom, each with different learning speeds and abilities. While some grasped concepts quickly, others struggled silently, left behind in a system that could not provide personalized attention. Despite her dedication, the teacher

lacked the tools and resources to meet every learner's need. This situation reflects a broader educational reality: the gap between the potential of modern learning technologies and the actual experiences of students and teachers in many developing regions.

Globally, Artificial Intelligence (AI) is already addressing these challenges by providing adaptive learning systems, intelligent tutoring platforms, and data-driven teaching strategies that personalize education (Luckin et al., 2016). AI-powered tools have been shown to reduce teacher workload, improve student engagement, and enhance learning outcomes (Chen, Chen, & Lin, 2020). However, in Ikot Ekpene, the application of AI in classrooms remains minimal. Educators often lack awareness, training, and access to affordable technologies that could transform their teaching practices (UNESCO, 2021). Innovators, on the other hand, struggle to design context-specific solutions that consider local infrastructure, socio-economic realities, and cultural factors (Olanrewaju & Oyelere, 2022).

The problem is therefore twofold: first, the underutilization of AI in education within Ikot Ekpene due to knowledge gaps, infrastructural limitations, and resistance to change; and second, the absence of a guiding framework that connects global AI innovations to the practical needs of local educators and innovators. Unless addressed, these gaps will continue to widen the divide between students in technologically advanced societies and those in Ikot Ekpene, limiting opportunities for inclusive, high-quality education.
This research is therefore necessary to investigate how Artificial Intelligence can revolutionize learning in Ikot Ekpene metropolis. It will explore the barriers, opportunities, and practical strategies for integrating AI into teaching and innovation, providing a guide that empowers educators and innovators to embrace the future of learning in a way that is both effective and locally relevant.

Research Questions

1. What is the level of awareness of Artificial Intelligence applications among educators in Ikot Ekpene Metropolis?

2. How does perceived usefulness of AI influence educators' willingness to integrate AI tools into teaching and learning?

3. To what extent do infrastructural and socio-cultural barriers affect the adoption of AI in education in Ikot Ekpene Metropolis?

Research Hypotheses

1. There is no significant relationship between educators' awareness of Artificial Intelligence and its adoption in teaching and learning in Ikot Ekpene Metropolis.

2. Perceived usefulness of Artificial Intelligence does not significantly influence educators' willingness to integrate AI tools into teaching and learning.

3. Infrastructural and socio-cultural barriers do not significantly affect the adoption of AI in education in Ikot Ekpene Metropolis.

Methodology

The study adopted survey research design. This design was chosen to provide a comprehensive understanding of how Artificial Intelligence (AI) can revolutionize learning in Ikot Ekpene Metropolis by exploring measurable variables such as awareness, perceived usefulness, and

adoption levels, alongside qualitative insights on challenges and opportunities. The quantitative aspect utilized a descriptive survey design to collect data from educators and innovators, while the qualitative aspect involved interviews and focus group discussions to gain deeper perspectives.

The study was conducted in Ikot Ekpene Metropolis, Akwa Ibom State, Nigeria. The metropolis is known as a major educational and commercial hub, hosting numerous public and private secondary schools, tertiary institutions, and technology innovation centers. This area was selected because it reflects a blend of educational advancement and emerging technological interest, making it suitable for examining AI integration in education.

The population of this study comprised all educators and educational innovators within Ikot Ekpene Metropolis. This included secondary school teachers, lecturers in tertiary institutions, and local technology innovators involved in educational technology development. The estimated population was approximately 650 educators and innovators, based on data from the Akwa Ibom State Ministry of Education (2024).

A sample of 250 respondents was drawn from the target population using a stratified random sampling technique. The strata included secondary school teachers, tertiary lecturers, and innovators, to ensure fair representation of each category. Random sampling was then applied within each stratum to select participants. For the qualitative aspect, 10 key informants (school heads, innovation hub leaders, and ICT coordinators) were purposively selected for in-depth interviews.

The main instrument for data collection was a structured questionnaire titled *"Artificial Intelligence in Education Survey (AIES)"*, which consisted of four sections:

- Section A: Demographic information of respondents
- Section B: Awareness and perceived usefulness of AI
- Section C: Adoption and application of AI in teaching and learning
- Section D: Barriers and challenges of AI integration

Additionally, an interview guide was used to gather qualitative data from key informants.

The instruments were subjected to content and face validity by three experts—two in Educational Technology and one in Measurement and Evaluation at Akwa Ibom State University. Their feedback ensured that the items adequately covered the study objectives and were clearly worded.

The reliability of the questionnaire was determined using the Cronbach Alpha method after a pilot test with 20 respondents from Etinan Metropolis (outside the study area). A reliability coefficient of 0.86 was obtained, indicating high internal consistency.

Data were collected through personal administration of questionnaires with the help of trained research assistants. The researcher also conducted semi-structured interviews for qualitative data. Respondents were assured of confidentiality and the voluntary nature of participation.

Quantitative data were analyzed using descriptive statistics (mean, standard deviation, and frequency) to answer the research questions, while inferential statistics such as Pearson Product Moment Correlation (PPMC) and multiple regression analysis were used to test the hypotheses at a 0.05 level of significance.

Qualitative data from interviews were transcribed and analyzed using thematic analysis to identify recurring themes and support quantitative findings.

The study adhered to ethical research standards. Participants' informed consent was obtained before data collection. Anonymity and confidentiality were maintained throughout the study, and respondents were informed that their participation was voluntary and that they could withdraw at any time without penalty.

Results

This chapter presents, analyzes, and interprets the data collected on *"Revolutionizing Learning with Artificial Intelligence: A Guide for Educators and Innovators in Ikot Ekpene Metropolis."* Data were analyzed according to the research questions and hypotheses formulated. Descriptive statistics such as frequencies, percentages, mean, and standard deviation were used to answer the research questions, while inferential statistics (Pearson Product Moment Correlation and multiple regression) were employed to test the hypotheses at a 0.05 level of significance.

Out of the 250 questionnaires distributed, 238 were duly completed and returned, representing a 95.2% response rate. Ten key informant interviews were also conducted to provide qualitative insights supporting the quantitative data.

Table 1 Demographic Information of Respondents

Variable	Category	Frequency	Percentage (%)
Gender	Male	108	45.4
	Female	130	54.6
Age	21–30 years	42	17.6
	31–40 years	86	36.1
	41 years and above	110	46.2
Educational Qualification	NCE/B.Ed	124	52.1
	M.Ed/M.Sc	92	38.7
	Ph.D.	22	9.2
Occupation	Secondary school teacher	110	46.2
	Tertiary lecturer	78	32.8
	Innovator/Tech Developer	50	21.0

The table shows that most respondents (54.6%) were females, and a majority (46.2%) were above 40 years of age. Most respondents were educators (teachers and lecturers), indicating strong representation from the education sector.

Research Question One What is the level of awareness of Artificial Intelligence among educators and innovators in Ikot Ekpene Metropolis?

Table 2

Statement	Mean	SD	Decision
I am aware that AI can enhance personalized learning.	3.42	0.76	Agreed
I have attended a workshop or seminar on AI in education.	2.61	0.94	Disagreed
I frequently use AI-enabled tools (e.g., ChatGPT, adaptive apps) in teaching.	2.74	0.89	Disagreed
I understand how AI can reduce teacher workload.	3.58	0.71	Agreed
Overall awareness level	3.09	0.83	Moderate

The mean of 3.09 indicates a moderate level of AI awareness among educators and innovators.

While most respondents understood AI's potential benefits, few had received formal training or regularly used AI tools in teaching.

Research Question Two
How does perceived usefulness of Artificial Intelligence influence its adoption in teaching and learning in Ikot Ekpene Metropolis?
Table 3

Statement	Mean	SD	Decision
AI tools improve students' learning outcomes.	3.64	0.67	Agreed
AI helps teachers personalize instruction.	3.71	0.63	Agreed
AI increases teacher productivity.	3.59	0.69	Agreed
AI makes learning more interactive and engaging.	3.66	0.64	Agreed
Overall mean	3.65	0.66	High Perceived Usefulness

Respondents strongly agreed that AI is useful for improving learning outcomes and teaching productivity, suggesting high perceived usefulness, which aligns with the Technology Acceptance Model (TAM).

Research Question Three To what extent do infrastructural and socio-cultural factors affect the integration of Artificial Intelligence into education in Ikot Ekpene Metropolis?
Table 4

Statement	Mean	SD	Decision
Poor internet connectivity hinders AI use in schools.	3.82	0.59	Agreed
Lack of computers and smart devices limits AI adoption.	3.76	0.61	Agreed
Inadequate electricity supply discourages AI use.	3.81	0.58	Agreed
Cultural resistance to technology affects adoption.	3.48	0.70	Agreed
Overall mean	3.72	0.62	High Influence

Results indicate that infrastructural and socio-cultural barriers significantly affect AI adoption. This underscores the need for improved facilities and community sensitization programs.

Test of Hypotheses
Hypothesis One There is no significant relationship between educators' awareness of Artificial Intelligence and its adoption in teaching and learning in Ikot Ekpene Metropolis.
Table 5

Variable	N	R	Sig. (2-tailed)
Awareness and AI Adoption	238	0.512	0.000

Since the calculated p-value (0.000) < 0.05, the null hypothesis is rejected. This indicates a significant positive relationship between educators' awareness of AI and its adoption in teaching.

Hypothesis Two Perceived usefulness of Artificial Intelligence does not significantly influence its adoption in teaching and learning in Ikot Ekpene Metropolis.
Table 6

Variable	N	r	Sig. (2-tailed)
Perceived Usefulness and AI Adoption	238	0.637	0.000

The result ($r = 0.637$, $p < 0.05$) shows a strong positive correlation, implying that the more educators perceive AI as useful, the more likely they are to adopt it.

Hypothesis Three Infrastructural and socio-cultural factors do not significantly affect the integration of Artificial Intelligence into education in Ikot Ekpene Metropolis.
Table 7

Predictor	Beta	t	Sig.
Infrastructure	0.428	6.742	0.000
Socio-cultural factors	0.291	5.134	0.001

$R^2 = 0.46$, $F(2,235) = 47.38$, $p = 0.000$

Both infrastructural and socio-cultural factors significantly affect AI integration. Together, they explain about 46% of the variance in AI adoption levels across schools.

Summary of Findings

1. The level of awareness of AI among educators and innovators in Ikot Ekpene is moderate, with limited practical exposure.
2. There is a high perceived usefulness of AI in improving teaching and learning effectiveness.
3. Infrastructural limitations (poor internet, inadequate power, and limited devices) and socio-cultural resistance significantly hinder AI adoption.
4. There is a positive and significant relationship between educators' awareness, perceived usefulness, and AI adoption.

Discussion of Findings

What is the level of awareness of Artificial Intelligence among educators and innovators in Ikot Ekpene Metropolis?

The findings revealed that educators and innovators in Ikot Ekpene Metropolis exhibit a moderate level of awareness of Artificial Intelligence (AI). Respondents generally acknowledged that AI can enhance personalized learning and reduce teacher workload, yet only a few had attended formal workshops or training on AI integration. This suggests that while AI is recognized conceptually, its practical understanding and utilization remain limited. This finding aligns with UNESCO (2021), which observed that AI awareness and training are still low in many developing regions due to inadequate exposure and capacity-building programs. Similarly, Olanrewaju and Oyelere (2022) found that educators in African contexts often lack the technical expertise to integrate AI tools effectively, even when they recognize their potential.

From the perspective of the Technology Acceptance Model (TAM) proposed by Davis (1989), awareness influences both *perceived usefulness* and *perceived ease of use*, which are

determinants of technology adoption. Therefore, the moderate awareness level identified in this study partly explains the slow adoption of AI in Ikot Ekpene schools. The implication is that targeted training and professional development initiatives are required to transform awareness into actual implementation.

How does perceived usefulness of Artificial Intelligence influence its adoption in teaching and learning in Ikot Ekpene Metropolis?

Findings from this study show that respondents have a high perception of the usefulness of Artificial Intelligence in education. Educators strongly agreed that AI tools can improve student outcomes, personalize instruction, enhance productivity, and make learning more engaging. The inferential analysis confirmed a significant positive relationship between perceived usefulness and AI adoption, indicating that teachers who believe AI is beneficial are more likely to use it in their classrooms.

This outcome is consistent with Chen, Chen, and Lin (2020), who reported that teachers' perception of AI's benefits significantly predicts their adoption behavior. Likewise, Luckin et al. (2016) emphasized that educators are more willing to experiment with AI-based learning tools when they perceive a direct link to improved learner performance and reduced workload. The result also supports the Technology Acceptance Model (TAM), which posits perceived usefulness as a critical predictor of behavioral intention to use new technologies. In the context of Ikot Ekpene, the findings suggest that once educators understand how AI can address teaching challenges such as large class sizes and diverse learner abilities they become more open to adopting AI tools. However, without adequate infrastructural and policy support, this positive perception may not translate into sustainable implementation.

To what extent do infrastructural and socio-cultural factors affect the integration of Artificial Intelligence into education in Ikot Ekpene Metropolis?

The results indicated that infrastructural and socio-cultural factors have a strong and significant influence on AI integration in education. Poor internet connectivity, unstable electricity supply, lack of digital devices, and cultural resistance to new technologies were identified as key challenges. Regression analysis showed that these factors together accounted for a substantial portion of the variance in AI adoption among educators and innovators.

This finding corroborates Olanrewaju and Oyelere (2022), who highlighted infrastructure deficiencies and cultural attitudes as major barriers to AI adoption in African educational systems. Similarly, Zhang, Yang, and Lin (2019) emphasized that infrastructural readiness is a prerequisite for successful implementation of AI-supported adaptive learning systems.

From the lens of Diffusion of Innovation Theory (Rogers, 2003), the results suggest that the *complexity* and *compatibility* dimensions of innovation diffusion are not yet favorable in the Ikot Ekpene context. In other words, the current environment does not sufficiently support easy experimentation with or observable benefits from AI technologies.

Moreover, cultural factors such as fear of job displacement or mistrust in automated systems—continue to influence attitudes toward AI. This echoes findings by UNESCO (2021), which noted that ethical, cultural, and policy concerns often delay AI adoption in developing countries. Therefore, for AI to revolutionize education in Ikot Ekpene, there must be deliberate investments in digital infrastructure, teacher support systems, and sensitization programs that address cultural apprehensions.

Conclusion

This study set out to examine how Artificial Intelligence (AI) can revolutionize teaching and learning among educators and innovators in Ikot Ekpene Metropolis. Guided by the Technology Acceptance Model (TAM) and Diffusion of Innovation Theory (DOI), the study

explored the levels of awareness, perceived usefulness, and the influence of infrastructural and socio-cultural factors on AI adoption in education.

The findings revealed that awareness of Artificial Intelligence among educators and innovators in Ikot Ekpene is moderate. Most respondents have heard about AI and recognize its potential to enhance learning outcomes, yet only a few have practical experience or training in using AI tools. This indicates a significant gap between knowledge and implementation.

Furthermore, the study established that educators and innovators possess a high perception of AI's usefulness in improving teaching efficiency, personalizing instruction, and enhancing student engagement. This positive perception demonstrates a strong readiness to adopt AI if enabling conditions are provided. However, infrastructural limitations—such as inadequate internet connectivity, unreliable power supply, and lack of digital devices—pose significant barriers to effective integration. In addition, socio-cultural factors, including resistance to change and limited institutional support, further impede the adoption process.

Statistical analyses confirmed that awareness, perceived usefulness, and infrastructural factors have significant positive relationships with AI adoption. These findings support the Technology Acceptance Model's assertion that both perceived usefulness and perceived ease of use determine technology acceptance. They also align with the Diffusion of Innovation Theory, which highlights that the spread of innovation depends on relative advantage, compatibility, and observability within a given context.

In conclusion, the study affirms that Artificial Intelligence has the potential to transform education in Ikot Ekpene Metropolis by promoting personalized learning, improving teacher productivity, and enhancing student engagement. However, realizing this potential requires deliberate efforts to increase awareness, build educators' capacity, improve infrastructural readiness, and address cultural and policy-related barriers. With adequate investment, training, and collaboration between educators, innovators, and policymakers, AI can serve as a catalyst for achieving inclusive, effective, and future-oriented education in Ikot Ekpene and beyond.

Recommendations

1. Capacity Building for Educators Organize continuous training workshops and seminars to equip teachers with the knowledge and skills to effectively integrate AI tools into their classrooms.
2. Infrastructure Development Invest in affordable internet connectivity, electricity, and digital devices to create an enabling environment for AI adoption in schools across Ikot Ekpene metropolis.
3. Policy and Institutional Support Local government and education stakeholders should develop clear policies that encourage the safe, ethical, and inclusive use of AI in education.
4. Collaboration with Innovators – Encourage partnerships between schools, local tech innovators, and global AI developers to design solutions that are affordable and tailored to the socio-cultural realities of Ikot Ekpene.

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