

ARTIFICIAL INTELLIGENCE IN SECONDARY EDUCATION: TEACHER PERCEPTIONS, INSTRUCTIONAL DECISIONS, AND INTEGRATION CHALLENGES IN NIGER STATE

Dr. Musbahu, Abdulrahim

Department of Science Education, Faculty of Education
Alex-Ekwueme Federal University, Ndufu, Alike, Abakaliki, Ebonyi State

Phone: +2348136473307

Email: misbahu4asmau@gmail.com

Abstract

This study investigated artificial intelligence in secondary education with emphasis on teacher perceptions, instructional decisions, and integration challenges among teachers in Niger State, Nigeria. The study adopted a descriptive survey research design. The population comprised teachers in public secondary schools in Niger State, while a purposive sample of 60 teachers (35 males and 25 females) was selected for the study. Data were collected using an instrument titled *Artificial Intelligence Integration Questionnaire (AIIQ)*. The instrument was validated by experts in science education, while reliability coefficient was 0.86 using Cronbach's alpha, indicating high internal consistency. Three research questions and three corresponding null hypotheses guided the study. Descriptive statistics of mean and standard deviation were used to answer the research questions, while inferential statistics of Independent Samples t-test were employed to test the hypotheses at the 0.05 level of significance. Findings revealed that teachers generally held positive perceptions toward the use of artificial intelligence in secondary education, acknowledging its potential to improve lesson planning, assessment, and personalized learning. The results also indicated that AI tools moderately influenced teachers' instructional decisions, particularly in content delivery, students and assessment. However, significant challenges were identified, including limited technical skills and insufficient professional training in AI applications. There was no significant gender difference in teachers' perceptions of AI integration, but a significant relationship was observed between teachers' level of AI awareness and their instructional decision-making practices. Although, teachers in Niger State recognize the pedagogical value of artificial intelligence, several structural and professional barriers hinder its effective integration in secondary education. It was recommended that government and educational stakeholders develop clear policy guidelines to support the responsible and effective use of artificial intelligence in teaching and learning.

Keywords: Artificial Intelligence, teachers, Perceptions, Instructional Decisions, and Integration Challenges.

Introduction

The rapid advancement of digital technologies has significantly transformed many sectors of society, including education. One of the most influential technological developments in recent years is Artificial Intelligence, which refers to computer systems capable of performing tasks that normally require human intelligence such as learning, reasoning, decision-making, and problem solving (Ertmer & Ottenbreit-Leftwich, 2019). In educational contexts, AI technologies are increasingly being integrated into teaching and learning processes to enhance instructional delivery, automate administrative tasks, and provide personalized learning experiences for students (Holmes *et al.*, 2019).

Globally, educational systems are exploring the potential of AI tools such as intelligent tutoring systems, automated grading platforms, and adaptive learning software. These technologies have the potential to support teachers in making informed instructional decisions, monitoring students' learning progress, and improving overall teaching effectiveness (Yusuf & Balogun, 2021). The emergence of AI in education aligns with the principles of the Technology Acceptance Model (TAM), which explains how users come to accept and use new technologies based on perceived usefulness and perceived ease of use (Selwyn, 2019).

In secondary education, science teachers are particularly positioned to benefit from Artificial Intelligence (AI) integration because science subjects often involve complex concepts that can be enhanced through digital simulations, data analysis tools, and intelligent learning systems. AI technologies enable teachers to design interactive learning experiences that support deeper understanding of scientific concepts and processes (Luckin *et al.*, 2016). In addition, AI can assist teachers in preparing lesson plans, designing assessments, and providing individualized feedback to students, thereby improving instructional efficiency and learner engagement. However, despite these potential benefits, the successful implementation of AI in schools largely depends on teachers' perceptions, readiness, and competence in using such technologies (Holmes *et al.*, 2022). In Nigeria, the integration of emerging technologies in education is still developing. Many secondary schools face challenges such as limited digital infrastructure, inadequate teacher training, and insufficient policy frameworks to support technological innovation. These limitations often hinder the effective adoption of advanced educational technologies such as AI (Ayanwale *et al.*, 2023). In Niger State, these issues may further affect teachers' willingness and ability to adopt AI-based instructional tools. Teachers' perceptions and attitudes toward new technologies play a critical role in determining whether such technologies are successfully integrated into classroom practices (Yusuf & Balogun, 2021).

Furthermore, teachers' instructional decisions such as selecting teaching strategies, learning resources, and assessment methods may be influenced by their understanding and acceptance of

AI technologies. Teachers who possess positive perceptions of AI are more likely to integrate it into their instructional practices to enhance student learning outcomes (Ertmer & Ottenbreit-Leftwich, 2019). Conversely, teachers who lack confidence in using technology may resist adopting AI tools in their teaching. Research has shown that teachers' beliefs and technological competence significantly influence their adoption of innovative instructional technologies (Chiu & Chai, 2020).

Another significant concern is the presence of integration challenges. These may include lack of technical skills, inadequate access to AI tools, unreliable internet connectivity, and insufficient professional development opportunities. Such challenges can limit the effective use of AI technologies in secondary schools, particularly in developing regions where technological resources may be scarce (UNESCO, 2021). Despite the growing global interest in AI in education, empirical studies examining teachers' perceptions and integration challenges in Nigerian secondary schools remain limited (Zawacki-Richter *et al.*, 2019). This study therefore investigates artificial intelligence in secondary education with emphasis on teacher perceptions, instructional decisions, and integration challenges among science teachers in Niger State.

Statement of the Problem

The introduction of AI technologies in education presents new opportunities for improving teaching and learning. However, the successful integration of these technologies largely depends on teachers' perceptions, readiness, and competence in using them. In many Nigerian secondary schools, teachers still rely heavily on traditional teaching methods due to limited access to modern technological tools and insufficient training in digital pedagogy. As a result, the potential benefits of AI in enhancing science education may not be fully realized. Furthermore, teachers may have varying perceptions of AI technologies, which could influence their willingness to integrate them into classroom instruction.

In Niger State, little empirical evidence exists regarding how science teachers perceive artificial intelligence, how it influences their instructional decisions, and the challenges they encounter in integrating AI into their teaching practices. Without such information, policymakers and educational stakeholders may find it difficult to design effective strategies for promoting AI integration in secondary education. This study therefore seeks to examine the perceptions of science teachers toward AI, determine how AI influences instructional decisions, and identify the challenges affecting its integration in secondary schools in Niger State.

Purpose of the Study

The main purpose of this study is to investigate artificial intelligence in secondary education with emphasis on teacher perceptions, instructional decisions, and integration challenges among science teachers in Niger State.

Specifically, the study seeks to:

1. Examine Male and female science teachers' perceptions of AI integration in secondary schools.

2. Determine the influence of AI on male and female science teachers' instructional decisions.
3. Identify the challenges associated with integrating AI in science teaching.

Research Questions

The following research questions guided the study:

1. What are the perceptions of male and female science teachers toward the integration of artificial intelligence in secondary education in Niger State?
2. How does artificial intelligence influence instructional decisions among male and female science teachers in secondary schools?
3. What challenges do male and female science teachers face in integrating artificial intelligence into classroom instruction?

Hypotheses

The following null hypotheses were tested at a 0.05 level of significance:

HO₁: There is no significant difference between male and female science teachers' perceptions of artificial intelligence integration in secondary education.

HO₂: There is no significant influence of artificial intelligence usage on male and female science teachers' instructional decisions in secondary schools.

HO₃: There is no significant relationship between male and female science teachers' level of AI perceived integration challenges.

METHODS

The study adopted a descriptive survey research design. The population consisted of science teachers in public secondary schools in Niger State. A sample of 60 science teachers (35 males and 25 females) was selected using purposive sampling. Data were collected using a structured questionnaire titled: Artificial Intelligence Integration Questionnaire (AIQ). The instrument was validated by experts in science education and educational technology. Reliability was determined using Cronbach's alpha with a coefficient of 0.86. Questionnaires were administered directly to the teachers. Mean and standard deviation were used to answer the research questions and the decision rule for the mean was 3.0 while the independent sample t-test was used to analysed the null hypotheses at 0.05 level of significance.

Results

Demographic Characteristics of Respondents

Table 1: Distribution of Respondents by Gender

Gender	Frequency	Percentage (%)
Male	35	58.3
Female	25	41.7

Gender	Frequency	Percentage (%)
Total	60	100

The table 1 shows that 58.3% of respondents were male, while 41.7% were female.

Research Question One

What are the perceptions of male and female science teachers toward the integration of artificial intelligence in secondary education in Niger State?

Table 2: Mean Ratings of Teachers' Perceptions of AI

Gender	N	Mean	SD	Decision
Male	35	3.39	0.70	Agree
female	25	3.46	0.73	Agree
Grand Mean		3.40	0.72	Agree

The result shows a grand mean of 3.40 and SD of 0.72, indicating that science teachers generally have positive perceptions of AI integration in secondary education.

Research Question Two

How does artificial intelligence influence instructional decisions among male and female science teachers in secondary schools?

Table 3: Influence of AI on Instructional Decisions

Gender	N	Mean	SD	Decision
Male	35	3.28	0.64	Agree
female	25	3.35	0.66	Agree
Grand Mean		3.32	0.65	Agree

The findings indicate that AI moderately influences instructional decisions among science teachers with a grand mean of 3.31 and SD of 0.65

Research Question Three

What challenges do male and female science teachers face in integrating artificial intelligence into classroom instruction?

Table 4: Integration Challenges

Gender	N	Mean	SD	Decision
Male	35	3.40	0.68	Agree
female	25	3.46	0.71	Agree
Grand Mean		3.43	0.70	Agree

The result shows that teachers face significant challenges in AI integration, particularly lack of training and poor infrastructure. With a grand mean of 3.43 and SD of 0.70.

Testing of Hypothesis

Hypothesis One

HO₁: There is no significant difference between male and female teachers' perceptions of AI integration.

Table 5: Independent Samples t-test on Gender and AI Perception

Gender	N	Mean	SD	t	df	Sig (2-tailed)
Male	35	3.39	0.70	0.41	58	0.684
Female	25	3.46	0.73			

Since the p-value (0.684) is greater than the 0.05 level of significance, the null hypothesis is not rejected. This means that there is no significant difference between male and female teachers' perceptions of artificial intelligence integration in secondary education. Both genders share similar positive attitudes toward AI use in teaching.

Hypothesis Two

HO₂: There is no significant influence of artificial intelligence usage on male and female science teachers' instructional decisions.

Table 6: Independent Samples t-test on Gender and AI Influence on Instructional Decisions

Gender	N	Mean	SD	t	df	Sig
Male	35	3.28	0.64	0.52	58	0.604
Female	25	3.35	0.66			

The table 6 indicates that there is no significant gender difference in the influence of AI on teachers' instructional decisions. The p-value (0.604) > 0.05, therefore the null hypothesis is not rejected. Both male and female teachers experience similar levels of AI influence in their teaching practices.

Hypothesis Three

HO₃: There is no significant relationship between male and female science teachers' level of perceived artificial intelligence integration challenges in secondary schools.

To test this hypothesis, an Independent Samples t-test was conducted to determine whether there is a significant difference between male and female science teachers' perceived integration challenges regarding artificial intelligence.

Table 7: Independent Samples t-test on Gender and Perceived AI Integration Challenges

Gender	N	Mean	SD	t	df	Sig (2-tailed)
Male	35	3.40	0.68	0.36	58	0.721
Female	25	3.46	0.71			

The result presented in Table 7 shows that male science teachers obtained a mean score of 3.40 (SD = 0.68), while female science teachers obtained a mean score of 3.46 (SD = 0.71) regarding perceived challenges in integrating artificial intelligence into classroom instruction. The calculated p-value (0.721) is greater than the 0.05 level of significance. Therefore, the null hypothesis is not rejected. This implies that there is no statistically significant difference between male and female science teachers in their perceived challenges of integrating artificial intelligence in secondary schools. Both male and female teachers experience similar challenges such as lack of training in AI tools, poor ICT infrastructure, limited access to AI software, and inadequate institutional support.

Discussion

The findings from Research Question One revealed that science teachers generally have positive perceptions toward artificial intelligence integration (Grand Mean = 3.42). Teachers agreed that AI improves teaching effectiveness, supports personalized learning, enhances lesson planning, and strengthens student assessment. This finding aligns with Holmes *et al.* (2019), who argued that

artificial intelligence technologies have the capacity to transform education through adaptive learning systems and intelligent feedback mechanisms. Similarly, Selwyn (2019) emphasized that teachers increasingly perceive AI as a supportive instructional tool capable of enhancing classroom efficiency and learner engagement.

Regarding Research Question Two, the results showed that artificial intelligence moderately influences teachers' instructional decisions (Grand Mean = 3.31). Teachers reported that AI assists in selecting instructional strategies, organizing lessons, monitoring students' progress, and improving assessment planning. This finding is consistent with Zawacki-Richter et al. (2019), who noted that AI-driven analytics support data-informed instructional decision-making. In addition, Ertmer and Ottenbreit-Leftwich (2019) asserted that technology integration positively influences teachers' instructional planning and classroom practices when educators perceive it as pedagogically useful.

Despite these positive perceptions and instructional benefits, the findings from Research Question Three indicated that teachers face significant challenges in AI integration (Grand Mean = 3.43), particularly lack of training and poor ICT infrastructure. These findings align with UNESCO (2021), which identified inadequate digital infrastructure and insufficient professional development as major barriers to AI adoption in developing countries. Similarly, Ayanwale *et al.* (2023) reported that limited digital literacy and inadequate technological resources significantly constrain teachers' readiness to adopt artificial intelligence tools in Nigerian schools.

The test of Hypothesis One revealed that there is no significant gender difference in teachers' perceptions of AI integration. This finding suggests that gender does not significantly influence teachers' attitudes toward artificial intelligence. The result supports Chiu and Chai (2020), who found that teachers' acceptance of emerging technologies is influenced more by perceived usefulness and ease of use than by demographic variables such as gender.

The test of Hypothesis Two also showed no significant gender difference in the influence of AI on instructional decisions, indicating that both male and female teachers utilize AI tools in similar ways. Holmes *et al.* (2022) noted that effective AI integration depends more on access, competence, and institutional support than on gender-related factors.

Finally, the test of Hypothesis Three revealed no significant gender difference in perceived AI integration challenges, suggesting that barriers to AI adoption are systemic rather than gender-based. Selwyn (2019) argued that institutional and infrastructural limitations are the primary constraints affecting educational technology implementation. Likewise, UNESCO (2021) emphasized that challenges associated with AI integration are largely structural and policy-driven rather than demographic.

Summary

Teachers agreed that artificial intelligence can improve teaching effectiveness, support personalized learning, assist in lesson planning, enhance student assessment, and make science teaching more interactive. Teachers indicated that AI helps them select teaching strategies,

organize lessons effectively, monitor students' academic progress, and improve assessment planning. The major challenges identified include lack of training in AI tools, poor ICT infrastructure, limited access to AI software, lack of institutional support, and limited internet connectivity.

Conclusion

The study examined artificial intelligence in secondary education with emphasis on teachers' perceptions, instructional decisions, and integration challenges among science teachers in Niger State. The findings revealed that science teachers generally have positive attitudes toward the use of artificial intelligence in teaching and learning and recognize its potential to improve instructional effectiveness, personalized learning, and student assessment.

Furthermore, artificial intelligence was found to influence teachers' instructional decisions by supporting lesson organization, instructional planning, and student monitoring. However, despite these positive perceptions and potential instructional benefits, the integration of artificial intelligence in secondary schools remains constrained by several challenges, including inadequate training, poor technological infrastructure, and limited access to AI tools.

The study also revealed that gender does not significantly influence teachers' perceptions, instructional decisions, or perceived challenges regarding artificial intelligence integration. This suggests that both male and female teachers share similar views and experiences concerning the adoption of artificial intelligence in teaching.

Recommendations

1. The government should organize professional development programs to train teachers on artificial intelligence integration.
2. Schools should improve technological infrastructure to support artificial intelligence tools.
3. Educational policymakers should develop clear guidelines for the adoption of artificial intelligence in education.

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