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Teachers AI Awareness in Science Teaching in Urban and Rural Secondary Schools in Abua-Odual LGA. Implications for Stem Education

Joseph, Endurance Ayibatonye
Department of integrated Science

Omoghoyan B.A. Walson
Department of home Economics and Hospitality, Ignatius Ajuru University of Education, Port Harcourt

Abstract: This study examined teachers' awareness of Artificial Intelligence (AI) in science teaching in urban and rural secondary schools in Abua-Odual Local Government Area, highlighting implications for STEM education. A descriptive survey research design was adopted to obtain information from science teachers without manipulating any variables. The population comprised all science teachers in public and private secondary schools in the area, including teachers of Biology, Chemistry, Physics, and Basic Science. Using stratified random sampling based on school location, a sample of 70 science teachers from urban and rural schools was selected. Data were collected using a researcher-developed questionnaire titled "Teachers' AI Awareness in Science Teaching Questionnaire (TAASTQ)". The instrument was validated by experts in Science Education, Educational Technology, and Measurement and Evaluation, while its reliability was established using the Cronbach Alpha method, yielding a coefficient of 0.82. Data were analyzed using descriptive statistics to answer the research questions and inferential statistics to test the hypotheses at the 0.05 level of significance. Findings revealed that science teachers demonstrated a moderate level of awareness of AI in science teaching. The results also showed no significant difference in AI awareness between teachers in urban and rural secondary schools. One of the recommendations made was that educational authorities should develop clear guidelines and policies that encourage the inclusion of AI in STEM education, ensuring that teachers understand how AI aligns with curriculum objectives.

Key points: Teachers, AI Awareness, science teaching, urban and rural secondary schools, Abua-Odual LGA.

Introduction

Artificial Intelligence (AI) has become one of the defining innovations of the 21st century, shaping the global economy, governance, communication, healthcare, transportation, and education. Its rapid development and widespread application have fundamentally altered how humans interact with machines and with one another. From voice recognition systems like Siri and Alexa to sophisticated medical diagnostic tools, AI has evolved from being a futuristic concept to an everyday reality. In education, the rise of AI represents a paradigm shift, promising to reshape teaching and learning in unprecedented ways. Scholars such as Holmes et al. (2022) emphasize that AI is not merely another technological tool but a transformational force that can redefine pedagogical practices, assessment systems, and the overall learning environment. The integration of AI into education is particularly important in science teaching, where abstract concepts,

experimental procedures, and problem-solving processes often require innovative methods to foster deep understanding.

Artificial Intelligence is broadly understood as the capacity of machines or computer systems to perform tasks that would normally require human intelligence. This includes functions such as reasoning, problem-solving, learning, perception, and understanding natural language (Russell & Norvig, 2021). In practical terms, AI in education manifests through systems such as adaptive learning platforms that adjust lesson content to individual learners' needs, intelligent tutoring systems that provide personalized guidance, automated grading systems that free teachers' time for more complex instructional tasks, and predictive analytics that help teachers monitor and intervene in students' learning trajectories. The meaning of AI extends beyond technological novelty; it embodies a shift toward a more personalized, interactive, and inclusive learning environment that can respond to the needs of diverse learners. For 21st century education, the significance of AI is profound. It aligns with the demands of the knowledge-driven global economy, where critical thinking, creativity, digital literacy, and problem-solving are the essential skills. By enhancing science education, AI not only supports learners in mastering difficult concepts but also prepares them for STEM-related careers that are increasingly central to national and international development.

The importance of AI to education can also be understood from the perspective of equity and access. In many educational systems, especially in developing countries, traditional teaching methods have often been unable to adequately address the diverse needs of learners. Large class sizes, limited resources, and outdated pedagogies often mean that some students are left behind. AI presents an opportunity to overcome these challenges by offering personalized learning pathways, facilitating differentiated instruction, and enabling teachers to focus on higher-order tasks. UNESCO (2021) underscores the role of AI in achieving Sustainable Development Goal 4, which calls for inclusive and equitable quality education and lifelong learning opportunities for all. By equipping both teachers and learners with AI-driven tools, education systems can become more adaptive and responsive to the needs of students in diverse contexts. This significance is especially relevant in science education, where inquiry, experimentation, and conceptual clarity are vital.

Despite the potential benefits of AI, disparities in awareness and adoption exist, particularly between urban and rural school settings. Teachers in urban areas are more likely to be exposed to digital innovations because of relatively better access to electricity, internet connectivity, computers, and professional development opportunities. They may have greater opportunities to attend workshops, conferences, and training programs where the role of AI in education is discussed. They may also have peer networks that encourage collaboration, innovation, and experimentation with new technologies. In contrast, rural schools often face significant infrastructural challenges. Poor internet penetration, unreliable electricity, inadequate computer facilities, and fewer opportunities for professional development make it difficult for teachers in rural areas to stay abreast of technological innovations (Eke, 2021). These systemic barriers limit not only the awareness but also the confidence of rural teachers in engaging with AI. The urban-rural divide is therefore a key dimension in understanding variations in teachers' AI awareness and their capacity to integrate it into science teaching.

In addition to the urban-rural divide, teacher-related characteristics also play a significant role in determining levels of AI awareness. Gender is one of the most frequently discussed factors. Studies such as Mlambo and Adetunji (2022) have indicated that male teachers often report higher confidence in adopting digital technologies compared to their female counterparts. This may be linked to cultural stereotypes that portray technology as a male domain, as well as differential access to training and mentoring opportunities. However, other studies argue that when female teachers are given equal exposure and opportunities for professional development, the gender gap in awareness and utilization of technology significantly narrows (Okoro & Hassan, 2022). This suggests that gender differences are not inherent but socially constructed, and can be addressed through equitable access to training and support.

Educational qualification is another determinant of AI awareness. Teachers with postgraduate qualifications may have greater exposure to scholarly debates on technology integration, research seminars, and academic conferences where AI and education are discussed. They may also have broader pedagogical training that helps them appreciate the potential of AI in supporting inquiry-based learning and differentiated instruction. Ugwoke and Nwosu (2023), for example, found that postgraduate teachers in Enugu State secondary schools exhibited higher levels of AI awareness compared to their counterparts with only first degrees. This was attributed to their greater exposure to research and professional development. In contrast, teachers with lower qualifications may be more accustomed to traditional methods and less confident in experimenting with innovative approaches. Educational qualification thus reflects not only academic achievement but also access to networks and platforms that shape technological awareness.

Teaching experience is also a critical factor influencing AI awareness. Experienced teachers often have rich subject knowledge and classroom management skills, but they may also be more resistant to adopting new technologies if they are accustomed to established instructional routines. Younger teachers, by contrast, may be more open to experimenting with AI tools because of their exposure to digital technologies during their own training and studies. However, they may lack the pedagogical maturity to fully integrate these tools into meaningful learning experiences. Balancing experience with openness to innovation is therefore essential. Research by Akinola and Adeyemi (2022) in Lagos State found that younger teachers were more likely to use AI-driven tools in their teaching, while older teachers tended to rely on traditional methods, although the latter group acknowledged the potential of AI when introduced to it.

Subject specialization further shapes awareness and adoption of AI in science teaching. Teachers of physics, mathematics, and computer science may be more naturally attuned to AI applications because of the alignment between their subject content and technological innovation. For example, AI simulations can be directly applied in teaching concepts such as algorithms, motion, or statistical modeling. Teachers of biology and chemistry, however, may focus more on laboratory-based experiments and field activities, which are not always integrated with AI tools. Nonetheless, AI can support even these subjects by providing virtual labs, simulations of biological processes, and data analytics tools for chemistry experiments. A study by Adepoju and Bello (2022) in Oyo State revealed that physics and mathematics teachers reported higher levels of AI awareness compared to biology and chemistry teachers, a finding attributed to the more explicit connections between AI applications and their subject content.

A plethora of literature have consistently highlighted the disparities in AI awareness among teachers.For instance Akinola and Adeyemi (2022), in their study of Lagos secondary schools, found that urban teachers demonstrated higher levels of AI awareness than rural teachers, citing better infrastructure and training opportunities as the main reasons. Similarly, Ugwoke and Nwosu (2023) confirmed that teachers with postgraduate qualifications were more likely to integrate AI into science teaching. Okoro and Hassan (2022) observed that gender differences in AI awareness could be significantly reduced when female teachers had equal access to training. Similarly, Bello and Salami (2023) reported that teachers with fewer than five years of experience were more likely to adopt AI tools than those with over 20 years of experience, though the latter group showed openness when provided with structured professional development. These studies provide strong evidence that AI awareness is shaped by both structural factors such as infrastructure and training, and individual characteristics such as gender, qualification, experience, and subject specialization.

The rationale for this study lies in the urgent need to understand the current state of teachers' AI awareness in Abua-Odual Local Government Area, Rivers State. Abua-Odual provides a unique context because it encompasses both urban and rural communities, thus offering an opportunity to examine disparities in AI awareness within a single local government area. By investigating the influence of gender, educational qualification, teaching experience, and subject specialization, the study will provide nuanced insights into the patterns of AI awareness among science teachers. These insights are critical for informing policy interventions, teacher training programs, and

infrastructure development efforts aimed at enhancing STEM education in Nigeria. The findings will also contribute to the global discourse on the role of AI in education by providing context-specific evidence from a developing country. More broadly, the study aligns with Nigeria's National Digital Economy Policy and Strategy, which emphasizes the integration of digital technologies into education to foster innovation and competitiveness. It also resonates with global initiatives such as UNESCO's call for leveraging AI to achieve inclusive and equitable education. By situating the study within these policy frameworks, the research highlights its relevance not only to local stakeholders in Abua-Odual but also to broader national and international education agendas. Ultimately, this study recognizes teachers as central actors in the transformation of education. Their awareness of AI and willingness to adopt it into science teaching will determine the extent to which students are prepared for participation in the STEM-driven global economy. By shedding light on the current levels of awareness and the factors that shape it, the study contributes to efforts to ensure that no student, whether in urban or rural settings, is left behind in the digital revolution.

Research Questions

To guide the study, the following research questions were raised:

1. Does teachers' gender influence their awareness of AI tools in secondary schools?
2. What is the influence of teachers' educational qualifications on their AI awareness in secondary schools in the LGA?
3. What is the influence of teachers' subject specialization on their awareness of AI tools in secondary schools?
4. What is the influence of teachers' years of teaching experience on their AI awareness in secondary schools in the LGA
5. How does school type (public or private) affect teachers' awareness of AI tools in secondary schools.

Hypotheses

The following null hypotheses were formulated and tested at 0.05 levels of significance:

Ho1: There is no significant difference in the awareness of AI tools based on teachers' gender in secondary schools.

Ho2: There is no significant difference in the teacher's awareness of AI tools based on their educational qualifications.

Ho3: There is no significant difference in the influence of teachers' subject specialization on their AI awareness in secondary schools in the LGA?

Ho4: There is no significant difference in the influence of teachers' years of teaching experience on their AI awareness in secondary schools in the LGA?

Ho5: There is no significant difference in teachers AI awareness based on school Location (Urban or Rural)

Methodology

This study adopted a descriptive survey research design. This design was suitable because it allowed the researcher to gather information from a sample of teachers and to describe, compare, and analyze their awareness of Artificial Intelligence (AI) in science teaching without manipulating any variables. The population comprised all science teachers in public and private secondary schools within Abua-Odual Local Government Area, including teachers of Biology, Chemistry, Physics, and Basic Science. The accessible population consisted of those currently teaching in both urban and rural schools during the 2024/2025 academic session. A stratified random sampling technique was used, with school location (urban and rural) forming the main strata. From the

population, 70 science teachers were selected. Data were collected using a structured questionnaire titled *Teachers' AI Awareness in Science Teaching Questionnaire (TAASTQ)*, developed by the researcher in line with the study's objectives and research questions. The instrument had two sections: Section A captured demographic information, while Section B measured teachers' awareness of AI using a 4-point Likert scale ranging from Strongly Agree (4) to Strongly Disagree (1). To establish validity, the questionnaire was reviewed by three experts in Science Education, Educational Technology, and Measurement and Evaluation, and their inputs were reflected in the final draft. Reliability was determined using the Cronbach Alpha method. A pilot test involving 20 science teachers in a neighboring LGA produced a reliability coefficient of 0.82, indicating good internal consistency. Data collection was carried out by the researcher with trained assistants after obtaining permission from school principals. Respondents were assured of informed consent, confidentiality, and voluntary participation. Completed questionnaires were retrieved immediately to ensure a high return rate. Data analysis involved descriptive statistics (mean and standard deviation) for answering the research questions and inferential statistics (t-test and one-way ANOVA) for testing the hypotheses at the 0.05 significance level.

Result

Research Question 1. Does teachers' gender influence their awareness of AI tools in secondary schools?

Table 1. Mean and SD of gender response on the awareness and of AI Tools in secondary schools.

GENDER	AI Awareness
N	33
Male Mean	2.93
SD	0.39
N	37
Female Mean	2.86
SD	0.38

Table 1 shows that male students (N = 33) recorded a mean score of 2.93 (SD = 0.39) in AI awareness, while female students (N = 37) obtained a slightly lower mean score of 2.86 (SD = 0.38). This indicates that both groups demonstrated almost the same level of awareness of AI. In The findings highlight that both male and female students had comparable levels of awareness of AI, with only slight variations in their mean scores

HO1. There is no significant difference in the awareness of AI tools based on teachers' gender in secondary schools

Table 2: Summary of the independent t-test on the influence teachers' gender on the awareness of AI tools in secondary schools

Factor Sex		N	Mean	SD	df	t	P	Sig
AI Awareness	Male	33	2.93	0.39	68	.834	.407	NS
	Female	37	2.86	0.38				

The results of the independent sample t-test in table 2 revealed that there was no significant difference between male and female students in their level of awareness of Artificial Intelligence (AI). Male students had a slightly higher mean score (M = 2.93, SD = 0.39) compared to their female counterparts (M = 2.86, SD = 0.38). However, this difference was not statistically significant, $t(68) = 0.834$, $p = 0.407$, $p > 0.05$. The findings indicate that both male and female students demonstrated comparable levels of awareness of AI, with no gender-based disparity.

Research Question 2. What is the influence of teachers' educational qualifications on their AI awareness in secondary schools in the LGA?

Table 3. Mean and SD of the influence of teachers' educational qualification on the awareness and application of AI in secondary schools

Variable	Educational Qualification	N	Mean	SD
AI Awareness	NCE	12.00	2.82	0.24
	BED	16.00	2.91	0.43
	BSC	16.00	2.84	0.51
	PGDE	9.00	2.96	0.28
	MASTER	15.00	2.99	0.38
	PhD	2.00	2.75	0.07
	Total	70.00	2.90	0.38

Table 3 showed the results on **AI awareness** across educational qualifications indicate some variations in mean scores and standard deviations. Respondents with Master's degrees recorded the highest mean awareness score of **2.99 (SD = 0.38)**, followed by those with PGDE qualifications at **2.96 (SD = 0.28)**. Holders of the B.Ed. had a mean of **2.91 (SD = 0.43)**, while B.Sc. holders scored **2.84 (SD = 0.51).** NCE holders reported a mean awareness of **2.82 (SD = 0.24)**, and PhD holders had the lowest mean score of **2.75 (SD = 0.07).** The overall mean awareness score across all categories was **2.90 (SD = 0.38)**, suggesting generally high and consistent awareness levels, with postgraduate respondents (Masters and PGDE) showing slightly stronger awareness than other groups. These results suggest that awareness levels were fairly even across qualifications.

Ho2. There is no significant difference in the teacher's awareness of AI tools based on their educational qualifications.

Table 3. Showing the ANOVA of the influence of teachers' qualification on Awareness of AI tools in secondary schools

ANOVA							
		Sum of Squares	**df**	**Mean Square**	**F**	**p-value**	**Sig**
AI AWARENESS	Between Groups	0.319	5	0.064	0.413	0.838	NS
	Within Groups	9.870	64	0.154			
	Total	10.189	69				

Table 3 shows that the one-way ANOVA result indicates no significant difference in teachers' AI awareness across the groups examined. The result produced an F-value of **0.413 at df(5, 64)**, with a corresponding p-value of **0.838,** which is greater than the 0.05 level of significance. Based on this outcome, **H_{o2} was not rejected**.

Research Question 3. What is the influence of teachers' subject specialization on their awareness of AI tools in secondary schools?

Table 5 Showing the influence of Teachers subject specialization on the awareness of AI tools in secondary schools

	Subject Specialisation	N	Mean	SD
AI AWARENESS	Biology	14.00	2.98	0.40
	Chemistry	7.00	2.76	0.57
	Physics	8.00	2.88	0.37
	Integrated Science	18.00	3.01	0.26
	Agric Science	7.00	2.79	0.25
	Computer Science	10.00	2.91	0.13
	0thers	6.00	2.67	0.73
	Total	70.00	2.90	0.38

Table 5 shows the results of the differences in AI awareness based on subject specialization among secondary school teachers. The table revealed that Biology teachers had the highest level of AI awareness with a mean score of (3.11, SD=0.34), followed by Integrated Science teachers, with a high awareness mean of (M=3.07, SD=0.27). Computer Science teachers showed awareness (M =2.93, SD=0.15), Agricultural Science teachers had awareness (M = 2.76, SD=0.29), while Chemistry and Physics teachers recorded lower scores. Teachers in the "Others" category also showed a mean (2.67, SD=0.73) for awareness.

HO3 There is no significant difference in the influence of teachers' subject specialization on their AI awareness in secondary schools in the LGA?

Table 6. Showing the ANOVA of the influence of teachers' subject specialization on AI Awareness in secondary schools

		Sum of Squares	df	Mean Square	F	P-value.	Sig
AI AWARENESS	Between Groups	0.853	6	0.142	0.959	0.460	
	Within Groups	9.336	63	0.148			
	Total	10.189	69				

Table 6, the ANOVA result revealed that the calculated F(6, 63) **= 0.959**, p= **0.460** > α = 0.05. Since the p-value is greater than the 0.05 level of significance, the differences in teachers' AI awareness across the groups **are not statistically significant**. Therefore, HO3 is not rejected

Research Question 4. What is the influence of teachers' years of teaching experience on their AI awareness in secondary schools in the LGA?

Table 7. Summary of the descriptive statistics on the influence of Teachers subject specialization on their AI Awareness in secondary schools

		N	Mean	SD
AI AWARENESS	1-5yrs	26.00	3.03	0.36
	6-10yrs	31.00	2.80	0.34
	11-15years	10.00	2.80	0.42
	16yrs or above	3.00	3.03	0.71
	Total	70.00	2.90	0.38

Table 7, shows that teachers with 1–5 years of experience had a mean AI awareness score of (3.03, SD=0.37)**,** Teachers with 6–10 years of experience had a mean AI awareness score of (2.78 and SD 0.37)**,** For teachers with 11–15 years of experience**,** the mean AI awareness score was (2.80**,** SD= 0.44)**,** Teachers with 16 years or more of experience had a mean AI awareness score of (3.03**,** SD 0.70)**,** indicating more variation in responses.

Ho4. There is no significant difference in the influence of teachers' years of teaching experience on their AI awareness in secondary schools in the LGA?

Table 8 Showing the ANOVA of the influence of teachers' educational qualification on AI Awareness

ANOVA							
		Sum of Squares	df	Mean Square	F	p-value.	Sig
AI AWARENESS	Between Groups	0.954	3	0.318	2.271	0.088	
	Within Groups	9.235	66	0.140			
	Total	10.189	69				

Table 8 revealed the ANOVA result showing that the calculated F(3, 66) = **2.271** and p **= 0.088** > α = 0.05. Since the p-value is greater than the 0.05 level of significance, it indicates that the differences in teachers' AI awareness across the groups are **not statistically significant**. Therefore, **H_{04} is not rejected**.

Research Question 5. How does school location (urban or rural) affect teachers' awareness of AI tools in secondary schools.

Table 9. Mean and SD of teachers' awareness of AI tools in urban and rural secondary schools

School Location		N	Mean	SD
AI AWARENESS	URBAN	33.00	2.52	0.54
	RURAL	37.00	2.35	0.23

The result in table 9 shows that teachers in urban schools had a mean AI awareness score of 2.96, SD= 0.49**).** Teachers in rural schools**,** on the other hand, had a mean AI awareness score of (2.85, SD= 0.34**.** This means that, on average, urban school teachers are slightly more aware of AI and use AI tools more frequently than their rural counterparts.

HO5. There is no difference in the factors responsible for student's performance between Urban and rural schools

Table10: Summary of the independent t-test on teachers' awareness and application of AI tools in Urban and Rural secondary schools

Factor School Location		N	Mean	SD	df	t	P	Sig
AI Awareness	Urban	33	2.96	0.43	68	1.406	.164	NS
	Rural	37	2.84	0.33				

The results indicate that science teachers in urban schools recorded a slightly higher mean level of AI awareness (Mean = 2.96, SD = 0.43) compared to their counterparts in rural schools (Mean = 2.84, SD = 0.33). However, the difference in awareness between the two groups was minimal. The independent samples t-test further revealed that this difference was not statistically significant (t(68) = 1.406, p = .164).

Discussion

The analysis of students' awareness of Artificial Intelligence (AI) showed no meaningful gender difference. Male and female students displayed nearly equal levels of awareness, indicating that both groups are exposed to AI concepts in similar ways. The statistical test confirmed that the variation between them was not significant, which suggests that gender did not play a decisive role in shaping their level of AI awareness. This finding reflects the increasing democratization of digital knowledge, where AI-related information is widely available to all learners regardless of sex. With the rise of social media platforms, mobile learning applications, and online academic resources, students are more equally positioned to encounter AI content in their daily activities. Recent studies emphasize that AI awareness is no longer concentrated within particular demographic groups but has become more evenly distributed across educational environments. For instance, Nguyen et al. (2023) found that digital literacy programmes embedded in higher education curricula have reduced the gender divide in AI awareness among undergraduates. Similarly, Oke and Adejumo (2023) observed that Nigerian university students, irrespective of gender, reported comparable exposure to AI tools, attributing this to the widespread adoption of digital technologies in teaching and learning.

Globally, there is also evidence that efforts to integrate digital skills training into education are yielding results. UNESCO (2022) notes that the historical gender gap in digital competence, including AI awareness, is gradually closing due to policies promoting equitable access to technology. This supports the argument that the observed parity in awareness is not accidental but

rather the outcome of deliberate investments in ICT education and broader societal exposure to AI technologies. Nevertheless, equal awareness does not necessarily translate into equal opportunities for deeper engagement with AI. Scholars have argued that although both males and females may be familiar with AI in general, structural and cultural barriers may still limit how much female students engage with AI beyond basic awareness (Onyema et al., 2021). For example, stereotypes about technology being a male-dominated field can discourage female students from pursuing AI-related opportunities at advanced levels. This highlights the importance of moving beyond mere awareness to ensuring inclusive participation in AI-related training and practical applications. The results demonstrate that awareness of AI is now shared almost equally between male and female students. This finding supports the global trend of narrowing digital divides while also pointing to the need for continued interventions to ensure that awareness evolves into equitable participation and advanced engagement with AI systems.

The findings of this study indicate that teachers, regardless of educational qualification, demonstrated generally similar levels of awareness of Artificial Intelligence (AI) in science teaching. Although slight variations existed, these differences were not statistically significant. This suggests that academic qualification does not play a major role in determining AI awareness among science teachers in the study area.

Several recent studies support these findings. Afolabi and Olatunde (2023) reported that teachers' exposure to digital technologies is increasingly shaped by professional development programmes, school-based training, and online learning platforms rather than by their academic qualifications. Similarly, Yusuf and Adeyemi (2024) found that many teachers develop AI-related competencies through workshops, peer collaboration, and continuous self-directed learning, making their awareness levels relatively uniform across qualification categories. Chiemeka and Nwafor (2023) also emphasized that in-service training and teaching experience tend to have a stronger influence on technological awareness than initial degrees.

Global reports further reinforce this alignment. UNESCO (2023) and the OECD (2024) note that AI literacy is becoming a standard expectation for all teachers due to the rapid digitalization of educational systems. As a result, most teachers—whether degree or diploma holders—now have access to similar AI resources, training, and digital platforms.

However, some studies present contrary evidence. Eze and Okorie (2023) observed that teachers with higher academic qualifications, especially postgraduate degrees, often possess deeper theoretical knowledge and stronger engagement with emerging technologies, including AI. Likewise, Olagunju and Hassan (2024) reported that advanced-degree holders tend to participate more in academic conferences and technology-driven research, which may give them an advantage in AI awareness. Despite these contrary findings, the results of the present study indicate that qualification differences did not significantly influence AI awareness. This suggests that access to digital tools and professional learning opportunities is becoming increasingly equitable, allowing teachers across all qualification levels to develop comparable levels of AI awareness.

The findings indicate that although teachers' AI awareness appeared to vary slightly across subject specializations, these differences were not statistically significant. Biology and Integrated Science teachers showed slightly higher awareness levels, while teachers of Chemistry, Physics, and other subjects reported comparatively lower awareness. However, the ANOVA analysis confirmed that the variations among subject specializations did not reach statistical significance, leading to the retention of the null hypothesis (H_{03}). This suggests that subject specialization does not meaningfully influence AI awareness among secondary school teachers in the study area. These results align with recent studies that emphasize the growing accessibility of AI and digital tools across all subject areas. For instance, Afolabi and Olatunde (2023) found that professional development programs, online resources, and collaborative learning opportunities provide teachers of different subjects with comparable exposure to AI applications. Yusuf and Adeyemi (2024) also noted that continuous in-service training ensures that teachers, regardless of specialization, acquire similar levels of technological competence, supporting the uniformity observed in this study.

Conversely, some studies report subject-based differences in technological awareness. Eze and Okorie (2023) observed that teachers in science and technology-related subjects, such as Biology and Computer Science, often have higher exposure and engagement with AI tools compared to those teaching theoretical subjects. Similarly, Olagunju and Hassan (2024) noted that teachers' engagement with digital technologies could be influenced by the curriculum content, which may explain variations in awareness levels among different subject areas. Despite these contrary findings, the present study demonstrates that teachers across all specializations maintain relatively similar AI awareness, reflecting broader professional learning initiatives and equitable access to digital teaching resources. This suggests that subject specialization alone does not significantly determine AI awareness among secondary school teachers.

The findings suggest that while teachers' AI awareness varied slightly across different teaching experience levels, these differences were not statistically significant. Teachers with both relatively few and extensive years of experience showed slightly higher awareness, whereas those in the mid-experience range displayed marginally lower levels. The ANOVA result confirmed that these variations did not reach statistical significance, leading to the retention of the null hypothesis (H_{04}). This indicates that teaching experience alone does not significantly influence teachers' awareness of AI in science education. These results are consistent with studies highlighting that AI awareness is increasingly influenced by access to professional development programs, workshops, and digital resources rather than years of teaching experience. For example, Afolabi and Olatunde (2023) reported that teachers at all career stages can attain similar technological competencies through targeted training. Yusuf and Adeyemi (2024) also found that ongoing in-service training and collaborative learning opportunities enable teachers, regardless of experience, to develop comparable levels of AI awareness. In contrast, some studies suggest a positive relationship between teaching experience and technological awareness. Chiemeka and Nwafor (2023) observed that more experienced teachers tend to engage more effectively with emerging technologies due to their accumulated pedagogical skills and familiarity with curriculum implementation. Similarly, Eze and Okorie (2023) noted that teachers with extensive classroom experience often integrate new tools more confidently, potentially giving them an edge in AI awareness. Despite these contrasting findings, the present study demonstrates that teaching experience does not significantly affect AI awareness among secondary school teachers, suggesting that professional learning initiatives and equitable access to digital resources may level the field for teachers at different career stages.

Recommendation

1. Educational authorities should develop clear guidelines and policies that encourage the inclusion of AI in STEM education, ensuring that teachers understand how AI aligns with curriculum objectives.
2. Schools should organize practical AI workshops and projects to encourage all students, especially females, to engage deeply with AI in science learning.
3. Schools, especially in rural areas, should be provided with adequate technological infrastructure, including AI-based educational software, internet access, and teaching aids, to support teachers in applying AI effectively in science instruction.

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