ASSESSING PRINCIPALS' ARTIFICIAL INTELLIGENCE (AI) AWARENESS, LITERACY AND COMPETENCIES

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Abstract: *This study assessed principals' awareness, literacy, and competency in Artificial Intelligence (AI) in secondary schools in Gusau Metropolis, Zamfara State. The study adopted a descriptive survey design. A researcher-designed questionnaire was used as the instrument for data collection, with an overall reliability coefficient of 0.83 established through Cronbach's Alpha. Data were analyzed using mean and standard deviation to answer the research questions, while regression analysis was employed to test hypotheses at the 0.05 level of significance. Findings revealed that principals had a high level of awareness of AI in education (x = 3.2), but their literacy and competency in applying AI tools for administrative and instructional purposes were low (x = 1.6 and 2.3). Also, there was a positive significant interrelationship among principals' awareness, literacy and competency of AI (p<0.05). This study concluded that there is a pressing need for targeted interventions that move beyond awareness campaigns and focus on building functional AI literacy and hands-on competence. The study recommended among others that specific capacity-building programs and continuous professional development should be organized to bridge the gap between awareness and effective application of AI in school leadership.*

Keywords: *artificial intelligence, principals, awareness, literacy, competency*

Introduction

The rapid advancement of Artificial Intelligence (AI) is transforming education globally and the evolution of education management had to adapt to the times in which the world was changing quickly or unexpectedly in every way, based on a number of circumstances that were changing quickly at the time (Piatanom, 2022). As leaders responsible for shaping policies, managing resources, and ensuring quality education, administrators must understand how AI can improve teaching, learning, and school operations. AI is no longer a futuristic concept but a present reality that influences decision-making, administrative efficiency, and educational outcomes. AI literacy is increasingly important in various sectors, including education (Chung et al., 2024; Zhang et al., 2024; Wang & Lester, 2023; & Casal-Otero et al., 2023). As AI technologies become more prevalent, educators and administrators need to develop AI-related skills and competencies to integrate these technologies meaningfully into their professional practices (Tenberga & Daniela, 2024). As such, it is expected that school administrators who embrace AI literacy can lead their institutions toward innovation, inclusivity, and enhanced academic performance. In today's rapidly evolving educational landscape, school administrators must develop AI literacy and competencies to effectively manage institutions and enhance learning outcomes. A fundamental understanding of artificial intelligence is essential, including knowledge of what AI is, how it works, and its applications in education.

Secondary education in Nigeria is a critical stage in the country's education system, serving as a bridge between primary education and tertiary institutions. It plays a significant role in shaping students' academic, vocational, and personal development, equipping them with the necessary knowledge and skills to contribute to national growth. Governed by the National Policy on Education (Federal Republic of Nigeria, 2014), secondary education in Nigeria aims to prepare students for higher education, employment, and responsible citizenship. Nigeria operates a 6-3-3-4 education system, where students spend six years in primary school, three years in junior secondary school (JSS), three years in senior secondary school (SSS), and at least four years in tertiary institutions. Secondary education is divided into: 1. Junior Secondary School (JSS 1–3): This phase focuses on basic education, including subjects like Mathematics, English, Science, Social Studies, and vocational skills. It is part of the Universal Basic Education (UBE) program, which makes it free and compulsory. 2. Senior Secondary School (SSS 1–3). This stage prepares students for specialization in either science, arts, or technical subjects. It culminates

in the Senior School Certificate Examination (SSCE) conducted by bodies like WAEC (West African Examinations Council) and NECO (National Examinations Council). Therefore, the understanding of AI literacy and competency in educational leadership will help in ensuring that educational institutions are prepared for the challenges and opportunities of the digital age.

One of the primary reasons school administrators need AI literacy is its transformative impact on teaching and learning. AI-powered tools, such as adaptive learning platforms, personalized tutoring systems, and intelligent assessment technologies, can revolutionize education. These tools analyze students' learning patterns and provide tailored instruction, allowing educators to meet diverse learning needs. Without AI literacy, administrators may struggle to identify, implement, and manage these technologies effectively. By understanding AI, they can make informed decisions about integrating AI-driven solutions that enhance student engagement and improve learning outcomes.

Moreover, AI literacy equips school administrators with the ability to leverage data-driven decision-making. AI systems can process vast amounts of educational data, offering insights into student performance, attendance patterns, and learning gaps. Administrators who understand AI can use these insights to develop strategies for improving academic achievement, addressing student challenges, and optimizing resource allocation. For instance, AI-powered analytics can help school leaders identify at-risk students early and implement targeted interventions to support their learning progress. Without AI competency, administrators may miss opportunities to use data effectively for educational planning and student support.

Beyond academics, AI can enhance administrative efficiency by automating routine tasks such as scheduling, grading, and communication. AI-driven human resource management can streamline recruitment, performance evaluation, and staff development processes. Furthermore, AI-powered communication platforms can strengthen engagement with parents and the wider community, fostering collaboration and transparency. To effectively integrate AI into school systems, administrators must also prioritize professional development. This involves facilitating AI literacy programs for teachers and staff, equipping them with the skills to use AI tools effectively in classrooms. Additionally, school leaders should embrace a lifelong learning mindset by staying updated on emerging AI trends through workshops, seminars, and professional networks. As AI continues to shape the future of education, school administrators must be proactive in developing their AI competencies.

Statement of the problem

Artificial intelligence (AI) is rapidly transforming the education sector, offering innovative solutions for teaching, learning, and school administration. AI-driven technologies such as adaptive learning platforms, automated grading systems, predictive analytics, and administrative automation are increasingly being integrated into schools to enhance efficiency and decision-making. However, the successful implementation of these technologies largely depends on the AI literacy and competency of school administrators, who are responsible for guiding their institutions through digital transformation. Despite the growing relevance of AI in education, there is a lack of empirical data on the AI literacy levels and competencies of secondary school administrators, particularly in developing contexts. Many administrators may not fully understand AI concepts, its applications, or the ethical considerations surrounding its use. As a result, they may struggle to make informed decisions on AI adoption, provide necessary training for teachers, and ensure responsible AI integration in school operations. Additionally, concerns about AI ethics, data privacy, and digital divide issues further complicate AI adoption in secondary schools.

The absence of structured AI literacy training for school administrators also contributes to the problem. Without strong AI literacy and competencies, administrators risk making poor policy decisions, mismanaging AI tools, or failing to address AI-related challenges effectively. Given the increasing reliance on AI in education and the leadership role of school administrators, there is a pressing need to assess their AI literacy and competency levels, identify challenges they face, and recommend strategies for improving AI adoption in secondary schools. Measuring AI literacy is essential to identify gaps in knowledge and skills and to evaluate the effectiveness of AI literacy interventions (Carolus et al., 2023). This study seeks to address this gap by assessing the current state of AI literacy among secondary school administrators.

Purpose of the Study

The main purpose of this study is to examine the principals' level of awareness, literacy and competency of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria. Specifically, to:

1. Examine the principals' awareness level of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria.
2. Find out the principals' literacy level of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria.

3. Examine the principals' level of competency of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria.
4. Find out the significant interrelationship among principals' awareness, literacy and competency of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria.

Research Questions
The following research questions are raised to guide the study:
1. What is the current awareness level of AI among secondary school principals in Gusau metropolis in Zamfara State, Nigeria?
2. What is the principals' literacy level of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria?
3. What is the extent of principals' AI competency in secondary schools of Gusau metropolis in Zamfara State, Nigeria in secondary schools of Gusau metropolis in Zamfara State, Nigeria?

Research Hypotheses
Ho: There is no significant interrelationship among principals' awareness, literacy and   competency of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria

Review of Related Literature
Artificial Intelligence
Eiriemiokhale and Sulyman (2023) defined AI as the advancement of computer systems capable of performing tasks that would ordinarily need human intellect, such as decision making, object detection, solving complex issues, and so on. Artificial Intelligence (AI) is an overarching 'umbrella' term including techniques such as expert systems, machine learning, neural networks, deep learning, and more (Baker et al., 2019; Raso et al., 2018; Wang, 2021b; Zawacki-Richter et al., 2019). Artificial Intelligence (AI), defined by AFSA (2022), Copeland (2023), Alagbe (2023), and Ogunode & Ukozor (2023), encompasses computer systems and technologies that emulate human intelligence, undertaking tasks like learning, reasoning, and problem-solving. These technologies, including machine learning and robotics, have diverse applications across sectors such as health care, finance, transportation, and education, holding the potential to revolutionize industries and create new opportunities for advancement. 2023 defined as computational systems and toolsets capable of rational thinking or, in some cases, human-like cognition (Southworth, Migliaccio, Glover, Reed, McCarty, Brendemuhl, Thomas, 2023).

School Administrators

School administrators are education professionals responsible for overseeing the management, operations, and strategic direction of schools. They play a crucial role in ensuring that school's function efficiently while maintaining high academic and administrative standards. Administrators include principals, vice-principals, head teachers, directors, and other leadership personnel who make key decisions related to curriculum implementation, staff management, student welfare, and financial planning. Their responsibilities extend beyond academic leadership to include policy development, resource allocation, teacher supervision, and school-community relations. They also act as liaisons between educational authorities, government agencies, and stakeholders, ensuring that schools comply with regulations and maintain quality standards. In the digital age, school administrators must navigate technological advancements, such as artificial intelligence (AI), to enhance educational outcomes and streamline school operations.

Effective school administration requires leadership, decision-making, problem-solving, and communication skills. Administrators influence the learning environment by fostering innovation, supporting teachers, and ensuring that students receive a well-rounded education (Zhang et al., 2024; & Chee et al., 2024). As schools increasingly adopt AI-driven solutions, the AI literacy and competency of administrators become essential for guiding digital transformation, improving administrative efficiency, and preparing students for the future. Thus, school administrators are pivotal figures in shaping the success and sustainability of educational institutions.

AI Awareness, Literacy and Competency

AI awareness is the ability to be informed about the capabilities and limitations of AI, as well as its ethical, social, and legal implications (Pinski & Benlian, 2024). AI literacy includes the ability to understand, evaluate, and apply AI technologies in different contexts (Velander et al., 2024). However, it is critical to differentiate between digital literacy and AI literacy in the ever-changing digital environment, since they both include unique sets of competencies and knowledge that are necessary for effectively navigating modern technologies. Digital literacy encompasses the fundamental skill and competence set required to proficiently utilize digital devices, communication tools, and networks. This encompasses proficiencies in utilizing software applications, overseeing digital assets, and participating in online communication and collaboration (Spante, Hashemi, Lundin & Algers, 2018; Pangrazio, Godhe, & Ledesma,

2020; & Redecker, 2023). However, AI literacy extends beyond fundamental digital abilities, embracing a more profound comprehension of artificial intelligence technology and its practical uses. AI literacy includes not only the ability to use AI tools but also the ability to grasp fundamental AI principles, analyze AI systems in a discerning manner, and address ethical concerns associated with AI use (Yi, 2021; Wang, Rau & Yuan, 2023; Sperling, Stenberg, McGrath, Åkerfeldt, Heintz & Stenliden, 2024). While digital literacy provides individuals with the necessary abilities to operate in a digital environment, AI literacy enables school administrators to effectively utilize and evaluate AI technologies, ensuring responsible and efficient integration into different areas of life and work.

AI literacy is becoming increasingly important in education, especially for school administrators in Nigeria, as it enables them to effectively integrate AI-powered tools and make data-driven decisions (Al-Abdullatif, 2025). AI literacy, in the context of school administration, refers to an understanding of AI concepts, applications, and ethical considerations, as well as the ability to implement AI-driven solutions effectively. AI is a bundle of four core capabilities: technology-related, work-related, human-machine-related, and learning-related capabilities (CSTA, 2017). Cetindamar et al. argue that technological capabilities, including tools and data literacy, are necessary for AI literacy, but in-depth programming skills are not included. Other conceptualizations, such as, emphasize components like awareness, usage, evaluation, and ethics, without including the ability to develop AI applications.

AI literacy is crucial for school administrators to navigate the evolving educational landscape (Zhang et al., 2024; & Chee et al., 2024). As AI technologies become more prevalent, administrators need to understand their potential applications and limitations (Al-Abdullatif, 2025; & Yue et al., 2024). AI literacy empowers them to make informed decisions about adopting and implementing AI tools in their schools (Okunade, 2024; & Samuel & Danladi, 2025). Furthermore, AI literacy enables administrators to evaluate the ethical implications of AI, ensuring responsible and equitable use of these technologies (Lateefat et al., 2024; & Okada et al., 2025)

AI Competency

Wosukoli (2019) defined competency as a set of behavior patterns a leader need in order to perform his/her tasks and functions. He stressed further that it could also refer to the noticeable acts showing one's knowledge and skills to do the job. Competency in AI involves not only basic knowledge but also the ability to critically evaluate and apply AI technologies in ways that enhance school management and

improve student learning outcomes. With the growing reliance on AI in education, it is essential for school administrators to develop both AI literacy and competency to ensure that schools leverage AI responsibly and effectively. Pinski and Benlian, (2024) summarized that AI competency is the application of knowledge, awareness, and skills in real-world situations, such as designing AI-based solutions for educational problems.

Literacy is more about knowing, and competency is more about applying the knowledge in an effective and beneficial way. It is related to confidence and attitude, and focuses on how well an AI user does. To sum it up, school administrators require AI awareness, literacy, and specific competencies to effectively integrate AI into educational settings.

Theoretical Framework

The study on exploring AI awareness, literacy and competency among secondary school administrators is grounded on Technology Acceptance Model (TAM) proposed by Davis in 1989. Davis used the Technology Acceptance Model (TAM) to provide a rationale for the observed computer usage trend seen in Figure 1. According to Davis (1989), the concepts of "perceived usefulness" and "perceived ease of use" refer to the subjective perception of potential users regarding the extent to which utilizing a specific system, such as a single platform electronic payment system, will enhance their overall experience and the level of effort they anticipate in using the target system, respectively.
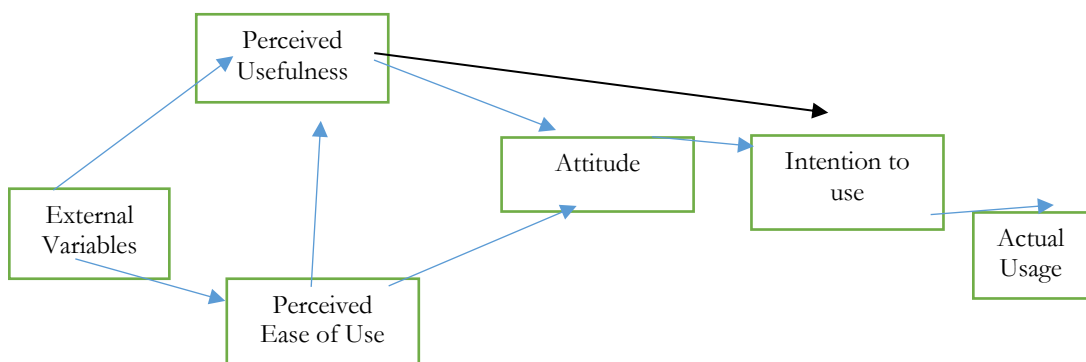
Figure 1: Davis, Bogozzi and Warshaw (1989)

This theoretical foundation helps in understanding how administrators acquire AI literacy, the factors influencing their competency, and the impact of AI integration on school management. For this study, TAM is relevant in assessing how school administrators perceive AI in

educational management. If administrators view AI tools as beneficial and easy to use, they are more likely to develop AI literacy and integrate AI-driven solutions in their schools. Conversely, if they perceive AI as complex or non-essential, their willingness to engage with AI technologies may be limited.

Methods
Research Design
This study employed a descriptive survey research design. The choice of this design was informed by the nature of the investigation, which sought to assess the levels of artificial intelligence (AI) awareness, literacy, and competency among principals and vice principals of secondary schools within Gusau metropolis, Zamfara State. A survey design was appropriate because it enabled the researcher to gather data directly from respondents on their current status and perceptions, analyze trends, and draw inferences without manipulating any variables. Furthermore, this design is widely recognized as effective in studies that focus on describing existing conditions and establishing statistical relationships among variables.

Population
The population for this study comprised all principals and vice principals of public secondary schools located within Gusau metropolis. This group was purposively selected because principals and vice principals serve as the administrative heads of their institutions, and their knowledge, literacy, and competencies in artificial intelligence are central to the adoption of emerging technologies in educational leadership, planning, and instructional delivery. Their strategic roles made them the most appropriate respondents for the objectives of the study.

Sample and Sampling Technique
A census approach was employed since the number of principals and vice principals in the metropolis was manageable and accessible. Therefore, all principals and vice principals in Gusau secondary schools were included in the study to ensure comprehensive coverage.

Instrumentation
The primary instrument for data collection was a structured questionnaire designed by the researcher. The questionnaire was divided into four sections. Section A elicited demographic information such as gender, age, academic qualification, and years of administrative experience. Section B contained items designed to

measure the level of AI awareness among principals and vice principals. Section C was focused on AI literacy, while Section D assessed their competencies in applying AI tools for school administration, decision-making, and instructional supervision. The questionnaire items were presented on a four-point Likert-type scale ranging from Strongly Agree (4) to Strongly Disagree (1). This format was chosen to facilitate easy quantification of responses and to allow for statistical analysis.

Validation of Instrument
To ensure the instrument measured what it intended to measure, the draft questionnaire was subjected to face and content validation. One expert in Measurement and Evaluation, and two in Educational Administration, Federal University, Gusau Zamfara State were consulted to evaluate the instrument. They reviewed the items for clarity, relevance, coverage, and alignment with the study objectives. Their feedback was incorporated to improve the precision, content adequacy, and construct validity of the questionnaire.

Reliability of Instrument
The reliability of the instrument was established through a pilot study conducted with ten principals and vice principals from secondary schools outside Gusau metropolis. The responses were analyzed using Cronbach's Alpha to determine the internal consistency of the items. The alpha values were: Section A (Awareness): 0.78; Section B (Literacy): 0.81; and Section C (Competency): 0.76. The overall reliability coefficient obtained was 0.83, which is above the 0.70 threshold considered acceptable in social science research. This confirmed that the instrument was reliable for data collection.

Method of Data Collection
The researcher personally administered the questionnaire to the respondents with the help of trained research assistants to ensure a high rate of return. Respondents were given adequate time to complete the instrument before collection.

Method of Data Analysis
The data collected were coded and entered into the Statistical Package for Social Sciences (SPSS) for analysis. Descriptive statistics, specifically mean scores and standard deviation, were used to answer the research questions. The mean provided a measure of the central tendency of respondents' views, while the standard deviation provided information about the degree of variability in their responses. To test

the hypotheses of the study, regression analysis was employed. This statistical technique was chosen because it allows for the examination of predictive relationships between independent variables (AI awareness and literacy) and the dependent variable (AI competency). Significance was tested at the 0.05 level.

Ethical Considerations
In conducting the study, ethical standards were strictly observed. Prior to data collection, permission was obtained from the relevant educational authorities in Zamfara State. Respondents were informed about the purpose of the study, and their participation was voluntary. They were assured of confidentiality and anonymity, and their responses were used solely for academic purposes. Care was also taken to ensure that the findings were presented objectively, without misrepresentation of data.

Findings
Research Question 1: What is the current awareness level of AI among secondary school principals in Gusau metropolis in Zamfara State, Nigeria?
Table 1: Awareness Level of AI among Secondary School Principals in Gusau Metropolis in Zamfara State, Nigeria

Awareness of:	Mean	SD	Awareness Level
Fundamentals of AI	2.8	0.79	Aware
AI Tools	3.2	0.93	Very Aware
AI Usage	2.7	0.87	Aware
AI Ethical Implications	3.0	0.90	Aware
AI in Daily Life	2.8	0.66	Aware
AI Data	2.7	0.68	Aware
Aggregated Mean	**=**	**3.0**	**(Aware)**

Note: Very Aware (VA) = 3.1 – 4.0l; Aware (A) = 2.1 – 3.0; Unaware (U) = 1.1 – 2.0. Very Unaware (VU) = 0.1 - 1.0
As shown in Table 1, most of the principals were aware of the fundamentals of AI, AI usage, ethical implications, AI in daily life and AI data with the mean scores of 2.8, 2.7, 3.0, 2.8 and 2.7 respectively. Also, it was revealed that the principals were very aware of AI tools with the mean score of 3.2. The aggregated mean of 3.0 was obtained to indicate that the secondary school principals were aware of AI. This shows that principals' awareness of level was high.
Research Question 2: What is the principals' literacy level of AI?

Table 2: Literacy Level of AI among Secondary School Principals in Gusau Metropolis in Zamfara State, Nigeria

Literacy in:	Mean	SD	Decision
Basics of AI	1.8	0.67	Low
the use of AI Tools	1.4	0.63	Low
the use of AI Software	1.5	0.65	Low
Ethical Use of AI	2.6	0.89	High
AI for Human Resource Management	1.2	0.60	Low
AI Data-Driven for Decision-Making	1.4	0.63	Low
AI for School Operations	1.2	0.57	Low
AI in Teaching & Learning	1.7	0.66	Low
Aggregated Mean = 1.6 (Low)			

Note: Very High (VH) = 3.1 – 4.0; High (H) = 2.1 – 3.0; Low (L) = 1.1 – 2.0; Very Low (VL) =   0.1 - 1.0

Table 2 shows that principals' literacy level of AI in secondary schools of Gusau Metropolis in Zamfara State in the basics of AI, the use of AI tools and software were low with the mean scores of 1.8, 1.4 and 1.5 respectively. Also, as shown in the Table, the literacy level of principals was low in AI for human resource management, Ai data-driven for decision making, AI for school operations and AI in teaching and learning with the mean scores 1.2, 1.4, 1.2, and 1.7 respectively. The Table revealed that principals' level of literacy in ethical use of AI was high with the mean score of 2.6. However, it was also shown that principals had lowest level of literacy in AI for human resources management and school operations (1.2 and 1.2). It was equally shown that principals had the highest level of literacy in the basics of AI and teaching and learning (x = 1.8 and 1.7). Despite this, the aggregated mean of 1.6 was obtained. This signifies that the principals' AI literacy level was low.

Research Question 3: How competent are principals in the utilization of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria?

A benchmark was set to determine the AI competency of principals in Secondary Schools in Gusau Metropolis in Zamfara State, Nigeria. This is as follows:

Table 3: Principals' AI Competency Level

S/N	Variables	Mean	SD	Decision
1	Basics of AI	2.0		Lowly Competent
2	the use of AI Tools	1.5		Lowly Competent
3	the use of AI Software	1.8		Lowly Competent
4	Ethical Use of AI	1.7		Lowly Competent
5	AI for Human Resource Management	0.7		Not Competent
6	AI Data-Driven for Decision-Making	1.6		Lowly Competent
7	AI for School Operations	0.8		Not Competent
8	AI in Teaching & Learning	2.3		Moderately Competent
Aggregated Mean =				

Note: Highly Competent (HC) = 3.1 – 4.0; Moderately Competent (MC) = 2.1 – 3.0; Lowly Competent (LC) = 1.1 – 2.0; Not Competent (NC) = 0.1 - 1.0

Table 3 shows the principals' AI competence level in secondary schools of Gusau Metropolis. As shown in the Table, the principals were lowly competent in the basics of AI, the use of AI tools and AI software with the mean scores of 2.0, 1.5 and 1.8 respectively. Also, principals were lowly competent in ethical use of AI and AI data-driven for decision making with the mean scores of 1.7 and 1.6. The Table further revealed that principals were not competent in AI for human resource management and school operations with the mean scores of 0.7 and 0.8. However, principals were moderately competent in AI for teaching and learning with the mean score of 2.3.

Ho: There is no significant interrelationship among principals' awareness, literacy and competency of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria

Table 4: Significant Interrelationship among Principals' Awareness, Literacy and Competency of AI

Table 3. Regression results of the independent and dependent variables

Variables	Coefficient	Std. Error	T-Value	P-Value	Remarks
Awareness	0.310	0.121	4.361	0.004	Significant
Literacy	0.426	0.032	5.222	0.001	Significant
Competency	0.423	0.034	5.320	0.000	Significant

S.E of Estimate 0.177
F-statistics 241.513
R^2 0.562

Adjusted R^2 0.878
Prob (F-statistics) 0.000
P = 0.05
N = 642

Table 4 shows that the P-value for principals' awareness, literacy and competency were less than 0.05 level of significance. This indicates all the variables are positively correlated with each other. The results reflect that the correlation between variables is significant (p<0.05). This indicates that principals' awareness, literacy and competency of AI have a positive interrelationship.

Discussion of Findings

The first purpose of this study was to assess the current awareness level of AI among secondary school principals in Gusau metropolis in Zamfara State, Nigeria. The finding to this purpose revealed that principals were aware of AI and their awareness of level was high. The finding that principals were aware of artificial intelligence (AI) in education resonates with the findings of Oke and Alabi (2022), who observed that school administrators were increasingly conscious of AI tools such as automated grading systems, intelligent tutoring platforms, and predictive analytics used for decision-making in schools. The finding of this current study also reinforced the findings of Zhang (2025) that educators in China exhibited high levels of awareness of AI technologies and expressed readiness to engage with them in teaching and school leadership; as Holmes et al. (2022) reported similar levels of awareness among school leaders, particularly regarding the ethical and pedagogical implications of AI.

The second purpose of this study was to determine the AI literacy of principals in Secondary School in Gusau Metropolis in Zamfara State, Nigeria. The finding to this purposed indicated that the principals' AI literacy level was low. This finding supported the finding of Garba and Waziri (2023) that many teachers and administrators lack the necessary AI literacy and skills to effectively use AI technologies. Yusri (2019) observed that there are still many administrators and teachers who do not know how to operate computers, especially using Microsoft Office Word applications, Microsoft Office Excel, and Microsoft Office PowerPoint. He further stressed that some older teachers are afraid to try to operate computers (technology stutter). Based on the findings, Tomte, Fossland, Aamodt, and Degn (2019) advised that in this present society, it is important to make, create, and update the abilities of individuals in information-based professions.

The third purpose of this study was to examine the AI competency of principals in Secondary Schools in Gusau Metropolis in Zamfara State,

Nigeria. The finding to this purpose revealed that principals were moderately competent in AI for teaching and learning. Some factors could be responsible for lack of AI competence among school administrators, such as insufficient or poor technical support, limited or no access to relevant software, poor implementation of ICT policies, insufficient computers and peripheral devices. Lack of electricity supply or recurrent electricity interruption

The fourth purpose of this study intended to investigate the interrelationship that existed among principals' awareness, literacy and competency of AI in secondary schools of Gusau metropolis in Zamfara State, Nigeria. The finding to this purpose established that there was a positive interrelationship among principals' awareness, literacy and competency of AI. This aligns with the finding of Ayanwale, Oduwaiye, and Abolarin (2024) that AI knowledge (a component of awareness) significantly predicted dimensions of AI literacy, such as problem-solving, ethical reasoning, and creative application; while the finding of Zhang (2025), in a study examining AI literacy among teachers, revealed significant correlations between literacy and related constructs such as trust and dependency. These findings reinforced the argument that principals' AI awareness, literacy, and competencies should not be treated as isolated constructs, rather, they exist in a dynamic relationship where growth in one dimension enhances the others. For principals, higher levels of awareness of AI in education lead to improved literacy in understanding its uses, which in turn strengthens their competency in applying AI to administrative decision-making, curriculum design, and instructional supervision.

Implications
Practical Implications
The study's findings reveal that while school administrators are highly aware of artificial intelligence (AI), they lack both literacy and competence in its practical application. Practically, this creates a gap between awareness and implementation. Administrators may recognize AI's potential to transform education but are unable to integrate it effectively into school management, teaching, or decision-making processes. This disconnect can hinder technological adoption in schools, limit innovation, and slow progress toward digital transformation in education. Additionally, it may create dependency on external experts for AI-related initiatives rather than empowering in-house leadership.

Theoretical Implications
From a theoretical perspective, the findings support technology adoption models such as the Technology Acceptance Model (TAM) and Diffusion of Innovations Theory. These frameworks emphasize that awareness and perceived usefulness are not enough to ensure adoption—literacy (knowledge) and competence (skills) are critical determinants of effective use. The study underscores that theoretical models of adoption should place greater emphasis on competence-building, particularly in leadership roles, as leadership directly influences organizational readiness and teacher uptake.

Conceptual Implications
Conceptually, the findings highlight the need to refine the understanding of "AI readiness" in educational contexts. Awareness alone does not equate to readiness. A more comprehensive framework for AI readiness should integrate three dimensions: awareness, literacy, and competence. The imbalance revealed - high awareness but low literacy and competence -suggests that readiness must be measured holistically. This conceptual clarification contributes to education technology discourse by distinguishing between cognitive recognition of AI and the practical capacity to deploy it effectively.

Conclusion
This study sought to examine the levels of AI awareness, literacy, and competence among school administrators. The findings revealed a pattern of high awareness but low literacy and competence, which has profound implications for policy and practice. The study concludes that although school administrators are highly aware of AI, their low levels of literacy and competence present significant challenges for educational institutions striving for digital transformation. Awareness without practical capacity is insufficient; administrators remain ill-equipped to translate their knowledge into actionable strategies. The findings demonstrate a pressing need for targeted interventions that move beyond awareness campaigns and focus on building functional literacy and hands-on competence. Strengthening these areas will ensure administrators not only recognize AI's importance but also harness it to improve educational administration, teaching, and learning outcomes.

Recommendations
Based on the findings of this study, the following are recommended that:

1. Zamfara State Ministry of Education and other recognized training institutions should periodically organize and implement structured capacity-building programs to strengthen school administrators AI literacy and enhance their overall professional competence through specialized workshops, continuous professional development programs, and certification courses
2. Educational policymakers should integrate mandatory digital leadership training into professional development requirements for school administrators. Such policies should ensure that AI literacy is a formal component of leadership competencies within the education sector especially in Zamfara State;
3. Government and education stakeholders should invest in the provision of adequate infrastructures. This includes the supply of digital tools, reliable internet access, and relevant software resources necessary to apply and practice AI-driven administrative skills effectively.
4. AI specialists should be encouraged to establish collaborative partnerships with teacher training institutions to create opportunities for school administrators to gain practical exposures, hands-on-experience, and mentorship from AI experts and educational technologists.
5. A well-organized monitoring and evaluation framework should be developed to measure the effectiveness of these initiatives. Regular assessments must track administrators' progress in AI literacy and competence over a period of time.

Limitations of the Study
The study may have limitations in terms of scope and methodology. It may have been conducted within a limited geographic or institutional context, thereby restricting the generalizability of the findings. Self-reported data could also have introduced bias, as administrators may overestimate their awareness or underestimate their competence. Furthermore, the study did not explore the contextual factors (e.g., availability of resources, institutional culture, or government support) that may mediate the relationship between awareness, literacy, and competence.

Suggestions for Further Studies
Future research should: Expand the scope to include teachers, students, and policymakers, allowing for a more holistic understanding of AI readiness in education. Investigate the role of contextual factors such as infrastructure, funding, and cultural attitudes in shaping AI literacy

and competence. Conduct longitudinal studies to track the effectiveness of training interventions in improving literacy and competence. Explore the relationship between administrators' AI competence and actual school-level outcomes, such as improved teaching quality, student learning, and administrative efficiency.

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