

## TEACHERS' DIGITAL COMPETENCE AND EFFECTIVE CLASSROOM MANAGEMENT IN THE ERA OF ARTIFICIAL INTELLIGENCE

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### Abstract

*This study investigated teachers' digital competence and effective classroom management in the era of Artificial Intelligence in public secondary schools in Cross River State, Nigeria. Specifically, the study examined the influence of teachers' digital literacy skills and AI pedagogical competence on effective classroom management. Two research questions guided the study, while two null hypotheses were formulated and tested at the 0.05 level of significance. A descriptive survey research design was adopted. The population comprised 6,248 teachers in public secondary schools in Cross River State, from which a sample of 375 teachers was selected using the Taro Yamane sample size determination formula and a multistage sampling technique. Data were collected using a researcher-developed instrument titled Teachers' Digital Competence and Effective Classroom Management Questionnaire (TDCECMQ). The instrument was validated by three experts, while its reliability was established using Cronbach's Alpha, which yielded a satisfactory reliability coefficient. Mean and Standard Deviation were used to answer the research questions, whereas Simple Linear Regression Analysis was employed to test the hypotheses at the 0.05 level of significance. The findings revealed that teachers' digital literacy skills exerted a high influence on effective classroom management (Grand Mean = 3.48), while AI pedagogical competence demonstrated a very high influence (Grand Mean = 3.54). The regression analysis further revealed that teachers' digital literacy skills significantly influenced effective classroom management ( $R^2 = 0.394$ ,  $p < 0.05$ ), while AI pedagogical competence also significantly influenced effective classroom management ( $R^2 = 0.506$ ,  $p < 0.05$ ). The study concluded that teachers' digital competence, particularly AI pedagogical competence, plays a vital role in enhancing effective classroom management in contemporary secondary schools. It was therefore recommended that educational authorities should strengthen teachers' digital competence through continuous professional development, provision of digital infrastructure, integration of AI pedagogy into teacher education programmes, and the formulation of policies that support the effective use of Artificial Intelligence in classroom instruction.*

**Keywords:** Digital competence, Digital literacy skills, Artificial Intelligence, AI pedagogical competence, Classroom management, Secondary school teachers.

### Introduction

The rapid advancement of digital technologies has fundamentally transformed virtually every sector of human endeavour, particularly the education sector. The Fourth Industrial Revolution (4IR), characterized by the convergence of digital technologies,

automation, cloud computing, big data analytics, robotics, and Artificial Intelligence (AI), has reshaped the way knowledge is created, accessed, disseminated, and applied in educational institutions. Consequently, the traditional teacher-centred approach to classroom

instruction is gradually giving way to technology-enhanced, learner-centred pedagogies that promote collaboration, creativity, critical thinking, communication, and problem-solving. These developments have placed increasing demands on teachers to acquire new digital competencies that enable them to effectively integrate emerging technologies into teaching, learning, assessment, and classroom management. As noted by UNESCO (2023), teachers' digital competence has become one of the most important determinants of quality education and sustainable educational development in the twenty-first century.

The digital transformation of education has further accelerated with the emergence of Artificial Intelligence. AI refers to computer systems capable of performing tasks that normally require human intelligence, including learning, reasoning, language processing, decision-making, prediction, pattern recognition, and problem-solving (Holmes, Bialik, & Fadel, 2019). Within educational settings, AI technologies have expanded the possibilities for personalized instruction, adaptive learning, intelligent tutoring systems, automated grading, predictive learning analytics, virtual teaching assistants, content generation, and classroom monitoring. These innovations are increasingly redefining teachers' professional roles from being mere transmitters of knowledge to facilitators, instructional designers, learning analysts, and managers of technology-supported classrooms (Chiu, 2023; Celik, 2023). Consequently, teachers who lack adequate digital competence may find it increasingly difficult to function effectively in AI-enabled educational environments.

Teachers' digital competence encompasses the knowledge, skills, attitudes, confidence, and ethical understanding required to effectively utilize digital technologies for instructional delivery, communication, assessment, collaboration, professional development, and classroom management (Redecker, 2017). Digital

competence extends beyond the ability to operate computers or digital devices; it includes selecting appropriate technological resources, evaluating digital information, creating digital learning content, protecting learners' digital safety, and integrating emerging technologies to improve learning outcomes. The growing complexity of educational technologies therefore requires teachers to continually update their digital competencies if they are to remain effective in contemporary classrooms (Cabero-Almenara et al., 2021).

The increasing integration of Artificial Intelligence into educational systems has further expanded the concept of teachers' digital competence. Beyond basic digital literacy, teachers are now expected to possess AI pedagogical competence, which involves understanding the educational applications of AI, selecting appropriate AI-powered instructional tools, integrating AI into lesson planning and classroom activities, interpreting AI-generated learning analytics, and addressing ethical concerns such as privacy, transparency, algorithmic bias, and responsible technology use (Kohnke, Moorhouse, & Zou, 2023). AI pedagogical competence enables teachers to maximize the instructional benefits of AI technologies while maintaining meaningful human interaction and pedagogical control within the classroom.

Among the numerous dimensions of digital competence, digital literacy skills remain one of the most fundamental. Digital literacy refers to the ability to locate, evaluate, organize, create, communicate, and manage information using digital technologies responsibly and effectively (Falloon, 2020). Teachers with adequate digital literacy skills are better able to utilize learning management systems, presentation software, educational applications, multimedia resources, cloud-based collaboration tools, virtual learning platforms, and digital communication technologies to facilitate effective teaching. Such competencies also enable teachers to manage classroom activities efficiently,

maintain learners' engagement, encourage collaborative learning, and respond appropriately to the challenges associated with technology-enhanced instruction (Bond et al., 2021).

Closely related to digital literacy is AI pedagogical competence, which has recently emerged as one of the most important competencies required of modern teachers. AI pedagogical competence involves the ability to integrate Artificial Intelligence technologies into instructional planning, lesson delivery, assessment, learner support, and classroom management while ensuring ethical and responsible use. Teachers possessing AI pedagogical competence are able to utilize intelligent tutoring systems, automated assessment applications, adaptive learning platforms, generative AI tools, predictive analytics, and virtual assistants to improve instructional effectiveness and classroom organization (Chiu, 2023). Such competence also enables teachers to personalize instruction according to learners' individual needs, monitor students' academic progress, identify learners requiring additional support, provide immediate feedback, and reduce administrative workload.

Effective classroom management remains one of the most critical determinants of successful teaching and learning. Classroom management refers to the strategies, practices, and techniques employed by teachers to establish an orderly learning environment, maintain discipline, maximize instructional time, encourage positive student behaviour, and promote active learner participation (Emmer & Sabornie, 2015). In contemporary educational environments, classroom management has expanded beyond maintaining discipline to include the effective management of digital devices, virtual classrooms, online collaboration, blended learning environments, and AI-supported instructional activities. Consequently, teachers' ability to manage both physical and digital learning

environments has become an essential indicator of professional effectiveness.

The growing dependence on educational technologies suggests that teachers' digital competence significantly influences classroom management. Teachers who possess strong digital literacy skills can effectively organize digital learning activities, communicate with learners through multiple digital platforms, utilize interactive instructional resources, monitor students' participation, and resolve technological challenges that arise during classroom instruction. Likewise, teachers with AI pedagogical competence can automate repetitive instructional tasks, analyse students' learning data, personalize instructional content, and improve classroom organization through AI-supported decision-making. These competencies collectively contribute to improved learner engagement, instructional effectiveness, and overall classroom management.

Globally, governments and educational organizations have continued to emphasize the importance of developing teachers' digital competence. The European Commission's Digital Competence Framework for Educators (DigCompEdu) identifies digital competence as one of the core professional competencies required for effective teaching in the digital era (Redecker, 2017). Similarly, UNESCO (2023) advocates continuous professional development programmes aimed at equipping teachers with digital and AI-related competencies necessary for improving educational quality. These international initiatives demonstrate that effective teaching in the twenty-first century increasingly depends on teachers' ability to integrate digital technologies into classroom practice.

In Nigeria, the integration of Information and Communication Technology (ICT) into education has received increasing attention through various educational reforms and policy initiatives. The Federal Ministry of

Education has consistently encouraged the integration of digital technologies into teaching and learning to improve instructional quality and prepare learners for participation in a knowledge-driven economy. Recent studies indicate that the digital transformation of Nigerian education has accelerated following the COVID-19 pandemic, with educational institutions increasingly adopting online learning platforms, virtual classrooms, learning management systems, and AI-assisted instructional technologies (Okpa et al., 2021; Osim, Omorobi, Ogar, & Adie, 2023). Nevertheless, the level of digital competence among teachers remains uneven, particularly in public secondary schools where infrastructural limitations and inadequate professional development continue to hinder technology integration.

Several Nigerian scholars have emphasized the growing relevance of digital technologies in improving educational effectiveness. For instance, Atah et al. (2023) reported that effective utilization of e-learning platforms significantly enhances curriculum content delivery in Business Education programmes within universities in Rivers State. Similarly, Atah et al. (2023) observed that digitalization of the Business Education curriculum remains essential for producing globally competitive graduates equipped with relevant digital competencies required in contemporary workplaces. Their studies demonstrate that digital technologies not only improve instructional delivery but also strengthen learner engagement, communication, and educational outcomes.

Similarly, Akpam, Adie, Udayi, and Ategwu (2022) found that teachers who actively participate in ICT-related professional development programmes demonstrate higher levels of instructional productivity than those with limited technological exposure. Their findings suggest that continuous digital competence development contributes significantly to teachers' effectiveness in lesson delivery and classroom management. Likewise, Okpa, Omorobi, and Udayi (2025) argued

that organizational behaviour and institutional support significantly influence the successful adoption of educational technologies within higher education institutions, highlighting the importance of supportive leadership and continuous staff development in technology integration.

Despite these encouraging developments, observations indicate that many teachers in Nigerian secondary schools continue to experience considerable challenges in utilizing digital technologies and AI-supported instructional tools effectively. Factors such as inadequate digital infrastructure, unstable internet connectivity, insufficient training opportunities, limited access to AI technologies, poor technical support, and resistance to technological change continue to constrain teachers' digital competence (Cabero-Almenara et al., 2021; Chiu, 2023). These challenges are even more pronounced in many public secondary schools where educational technologies are still emerging.

The educational consequences of inadequate teachers' digital competence are far-reaching. Teachers who possess limited digital literacy skills may experience difficulties in utilizing digital instructional resources, managing virtual learning environments, engaging digitally oriented learners, and maintaining effective classroom organization. Similarly, inadequate AI pedagogical competence may prevent teachers from utilizing intelligent educational technologies capable of improving personalized instruction, learner monitoring, formative assessment, and instructional decision-making. These limitations ultimately affect classroom management effectiveness and reduce opportunities for improving students' learning outcomes.

Although numerous international studies have established positive relationships between teachers' digital competence and effective classroom management, relatively few empirical studies have examined these relationships within Nigerian public secondary schools,

particularly in Cross River State. Most existing Nigerian studies have focused primarily on ICT utilization, e-learning, digital curriculum implementation, teachers' productivity, and educational technology adoption (Atah et al., 2023; Akpam et al., 2022; Okpa et al., 2021), while limited attention has been given to examining how digital literacy skills and AI pedagogical competence jointly influence effective classroom management in the era of Artificial Intelligence. This contextual gap necessitates further empirical investigation.

It is against this background that the present study examines the influence of teachers' digital competence, specifically digital literacy skills and AI pedagogical competence, on effective classroom management in public secondary schools in Cross River State, Nigeria. The findings are expected to provide empirical evidence that will guide educational policymakers, school administrators, teacher education institutions, curriculum planners, and professional development providers in designing appropriate interventions for strengthening teachers' digital competence. Ultimately, enhancing teachers' digital competence will contribute to more effective classroom management, improved instructional delivery, increased learner engagement, and better educational outcomes in the era of Artificial Intelligence.

### **Statement of the Problem**

The integration of digital technologies and Artificial Intelligence (AI) into education has significantly transformed teaching, learning, and classroom management across the world. Educational institutions are increasingly adopting digital platforms, intelligent learning management systems, AI-powered assessment tools, virtual teaching assistants, and other emerging technologies to improve instructional delivery and enhance students' learning experiences. These developments have made teachers' digital competence an essential professional requirement for

effective classroom management in the twenty-first century.

Effective classroom management extends beyond maintaining discipline to include organizing learning activities, promoting students' engagement, managing digital learning environments, utilizing educational technologies effectively, and creating an atmosphere conducive to meaningful learning. Teachers who possess adequate digital literacy skills and AI pedagogical competence are expected to manage both traditional and technology-supported classrooms more efficiently by using digital tools to facilitate communication, monitor students' progress, provide immediate feedback, and support personalized learning.

Despite the growing emphasis on digital transformation in education, observations indicate that many teachers still experience difficulties in effectively utilizing digital technologies and AI tools for classroom management. In many schools, classroom management continues to rely largely on conventional approaches, while available digital technologies are either underutilized or not effectively integrated into daily instructional practices. Some teachers possess only basic digital skills and may lack the competence required to employ AI-powered educational technologies for lesson delivery, classroom organization, learner engagement, and instructional decision-making. These deficiencies may result in reduced classroom effectiveness, poor management of digital learning activities, limited student participation, inefficient use of instructional time, and diminished learning outcomes.

Furthermore, although governments and educational institutions have invested considerably in digital infrastructure and teacher capacity development, variations still exist in teachers' levels of digital literacy and AI pedagogical competence. These disparities raise concerns about whether teachers possess the competencies required to effectively manage classrooms in an era increasingly characterized by

Artificial Intelligence and digital learning environments. While previous studies have examined technology integration, ICT competence, and AI adoption in education, relatively few have specifically investigated how the key dimensions of teachers' digital competence—namely digital literacy skills and AI pedagogical competence—influence effective classroom management.

It is this apparent gap in knowledge that necessitates the present study. Specifically, the study seeks to determine the influence of teachers' digital literacy skills and AI pedagogical competence on effective classroom management in the era of Artificial Intelligence. The findings are expected to provide empirical evidence that will assist educational administrators, policymakers, teacher education institutions, and teachers in developing strategies for strengthening digital competence and promoting more effective classroom management practices in contemporary educational settings.

### **Objectives of the Study**

The main objective of this study was to investigate the influence of teachers' digital competence on effective classroom management in the era of Artificial Intelligence. Specifically, the study sought to:

1. Determine the influence of teachers' digital literacy skills on effective classroom management.
2. Examine the influence of teachers' AI pedagogical competence on effective classroom management.

### **Research Questions**

The following research questions guided the study:

1. To what extent did teachers' digital literacy skills influence effective classroom management?
2. To what extent did teachers' AI pedagogical competence influence effective classroom management?

### **Research Hypotheses**

The study was guided by the following research hypotheses, which were tested at the 0.05 level of significance:

**H<sub>01</sub>:** Teachers' digital literacy skills have no significant influence on effective classroom management.

**H<sub>02</sub>:** Teachers' AI pedagogical competence has no significant influence on effective classroom management.

### **Methodology**

This study adopted a descriptive survey research design to investigate the influence of teachers' digital competence on effective classroom management in the era of Artificial Intelligence in public secondary schools in Cross River State, Nigeria. The descriptive survey design was considered appropriate because it enabled the researcher to collect data from respondents without manipulating the study variables. It also provided an opportunity to obtain teachers' opinions and perceptions regarding digital literacy skills, AI pedagogical competence, and effective classroom management within their natural educational settings.

The study was conducted in public secondary schools in Cross River State, located in the South-South geopolitical zone of Nigeria. The state comprises eighteen (18) Local Government Areas distributed across the Northern, Central, and Southern Senatorial Districts. Public secondary schools in the state have gradually embraced digital technologies to support teaching and learning, although the level of teachers' digital competence and the integration of Artificial Intelligence tools vary considerably across schools. The choice of the study area was informed by the need to examine how teachers' digital competence influences effective classroom management within the state's public secondary education system.

The population of the study comprised all 6,248 teachers in public secondary schools in Cross River State, as reported by the Cross River State Secondary

Education Board (2025). These teachers were considered suitable for the study because they are directly involved in classroom instruction and management and are expected to utilize digital technologies and emerging Artificial Intelligence tools to facilitate effective teaching and learning.

A sample of 375 teachers was selected using the Taro Yamane (1967) sample size determination formula. A multistage sampling procedure was employed to ensure adequate representation of the study population. Initially, public secondary schools were stratified according to the three senatorial districts of the state. Thereafter, simple random sampling was used to select participating schools from each district, while proportionate random sampling was adopted to select the required number of teachers from the sampled schools.

Data were collected using a researcher-developed structured questionnaire titled Teachers' Digital Competence and Effective Classroom Management Questionnaire (TDCECMQ). The questionnaire comprised two sections. Section A elicited demographic information such as gender, educational qualification, years of teaching experience, and school location, while Section B contained sixteen (16) items developed to measure the study variables. Eight items assessed teachers' digital literacy skills, whereas the remaining eight items measured AI pedagogical competence. The instrument was structured on a four-point rating scale of Very High Influence (4), High Influence (3), Low Influence (2), and Very Low Influence (1).

To ensure the validity of the instrument, it was subjected to face and content validation by three experts comprising one specialist in Educational Technology, one specialist in Measurement and Evaluation, and one specialist in Educational Management. The validators examined the instrument for clarity, relevance, adequacy of content, appropriateness of the language, and alignment of the items with the objectives of

the study. Their observations and recommendations were incorporated into the final version of the questionnaire before administration.

The reliability of the instrument was established through a pilot study involving thirty teachers drawn from public secondary schools outside the sampled schools but possessing characteristics similar to those of the study participants. Data obtained from the pilot study were analyzed using Cronbach's Alpha reliability coefficient to determine the internal consistency of the instrument. The reliability coefficient obtained exceeded the acceptable threshold of 0.70, indicating that the questionnaire possessed satisfactory internal consistency and was suitable for the study.

The researcher obtained the necessary approval from relevant educational authorities before administering the questionnaire. With the assistance of trained research assistants, copies of the questionnaire were personally distributed to the respondents. Participants were informed about the purpose of the study and assured that the information provided would be treated with strict confidentiality and used solely for academic purposes. Completed questionnaires were retrieved immediately after completion or on agreed dates to ensure a high response rate.

Data collected were analyzed using both descriptive and inferential statistics. Mean and Standard Deviation were used to answer the research questions, while Simple Linear Regression Analysis was employed to test the hypotheses at the 0.05 level of significance. A criterion mean of 2.50 served as the benchmark for interpreting respondents' ratings. Mean scores ranging from 3.50 to 4.00 indicated Very High Influence, 2.50 to 3.49 indicated High Influence, 1.50 to 2.49 indicated Low Influence, and 1.00 to 1.49 indicated Very Low Influence. For hypothesis testing, the null hypotheses were rejected whenever the probability value was less than 0.05 and retained whenever the probability value was equal to or greater than 0.05.

## Presentation of the Results

### Research Question One

*To what extent do teachers' digital literacy skills influence effective classroom management?*

**Table 1: Mean Analysis of Teachers' Digital Literacy Skills and Effective Classroom Management (N = 375)**

| S/N               | Items Statement                                                                       | Mean ( $\bar{X}$ ) | SD          | Decision              |
|-------------------|---------------------------------------------------------------------------------------|--------------------|-------------|-----------------------|
| 1                 | Teachers' ability to use digital devices improves classroom organization.             | 3.46               | 0.68        | High Influence        |
| 2                 | Digital literacy enables teachers to present lessons more effectively.                | 3.58               | 0.61        | Very High Influence   |
| 3                 | Teachers who are digitally literate effectively manage students' learning activities. | 3.42               | 0.73        | High Influence        |
| 4                 | The use of digital instructional resources enhances classroom discipline.             | 3.37               | 0.71        | High Influence        |
| 5                 | Digital literacy improves teachers' communication with students.                      | 3.49               | 0.66        | High Influence        |
| 6                 | Teachers with digital skills effectively monitor students' learning progress.         | 3.53               | 0.63        | Very High Influence   |
| 7                 | Digital literacy facilitates active student participation during lessons.             | 3.4                | 0.69        | High Influence        |
| 8                 | Digital competence enhances overall classroom effectiveness.                          | 3.55               | 0.6         | Very High Influence   |
| <b>Grand Mean</b> |                                                                                       | <b>3.48</b>        | <b>0.66</b> | <b>High Influence</b> |

The results presented in Table 1 revealed that teachers' digital literacy skills exerted a high influence on effective classroom management, as indicated by the grand mean score of 3.48 and a standard deviation of 0.66. The mean scores for all the questionnaire items ranged from 3.37 to 3.58, which were all above the criterion mean of 2.50. This indicates that the respondents generally agreed that teachers' digital literacy skills play a significant role in promoting effective classroom management. The relatively low standard deviation further suggests that the respondents expressed similar views regarding the influence of digital literacy on classroom management, indicating consistency in their responses.

The findings imply that teachers who possess adequate digital literacy skills are better equipped to utilize digital technologies to enhance instructional

delivery and classroom organization. The respondents agreed that digital literacy enables teachers to deliver lessons more effectively, communicate efficiently with students, organize learning activities, encourage active student participation, monitor learners' academic progress, and improve overall instructional effectiveness. Furthermore, teachers with strong digital literacy skills are more capable of integrating digital instructional resources into classroom practice, thereby creating interactive, engaging, and learner-centred environments that support effective classroom management. These findings underscore the importance of strengthening teachers' digital competencies to improve the quality of teaching and learning in the era of Artificial Intelligence.

### Research Question Two

*To what extent does teachers' AI pedagogical competence influence effective classroom management?*

**Table 2: Mean Analysis of Teachers' AI Pedagogical Competence and Effective Classroom Management (N = 375)**

| S/N               | Items Statement                                                           | Mean<br>( $\bar{X}$ ) | SD          | Decision                   |
|-------------------|---------------------------------------------------------------------------|-----------------------|-------------|----------------------------|
| 1                 | AI tools improve lesson planning and classroom organization.              | 3.61                  | 0.59        | Very High Influence        |
| 2                 | AI applications enhance personalized instruction.                         | 3.56                  | 0.62        | Very High Influence        |
| 3                 | Teachers with AI competence manage classroom activities more effectively. | 3.52                  | 0.65        | Very High Influence        |
| 4                 | AI supports effective monitoring of students' academic progress.          | 3.49                  | 0.68        | High Influence             |
| 5                 | AI-assisted assessment improves classroom management.                     | 3.47                  | 0.66        | High Influence             |
| 6                 | AI technologies increase students' engagement during instruction.         | 3.55                  | 0.61        | Very High Influence        |
| 7                 | AI pedagogical competence reduces teachers' instructional workload.       | 3.51                  | 0.64        | Very High Influence        |
| 8                 | AI competence enhances overall teaching effectiveness.                    | 3.6                   | 0.58        | Very High Influence        |
| <b>Grand Mean</b> |                                                                           | <b>3.54</b>           | <b>0.63</b> | <b>Very High Influence</b> |

The findings presented in Table 2 revealed that teachers' AI pedagogical competence exerted a very high influence on effective classroom management, as evidenced by the grand mean score of 3.54 and a standard deviation of 0.63. The mean scores for the individual questionnaire items ranged from 3.47 to 3.61, all of which exceeded the criterion mean of 2.50. This indicates that the respondents unanimously agreed that AI pedagogical competence is an important factor in promoting effective classroom management. The relatively low standard deviation further shows that the respondents' opinions were closely related, indicating a high level of consistency in their perceptions regarding the role of AI pedagogical competence in classroom management.

The findings further suggest that teachers who possess adequate AI pedagogical competence are better able to

integrate Artificial Intelligence technologies into instructional delivery and classroom activities, thereby improving teaching effectiveness and learners' academic experiences. The respondents agreed that AI pedagogical competence enhances lesson planning through the use of intelligent instructional tools, supports classroom organization by automating routine tasks, facilitates personalized instruction that addresses individual learners' needs, promotes active student engagement, and improves assessment practices through timely and data-driven feedback. In addition, AI competence enables teachers to monitor students' learning progress more effectively, make informed instructional decisions, and create innovative, interactive, and technology-supported learning environments. These findings highlight the growing importance of equipping teachers with AI pedagogical competencies as a

means of improving classroom management and ensuring effective teaching and learning

in the era of Artificial Intelligence.

## Test of Hypotheses

### Hypothesis One

*H<sub>01</sub>: Teachers' digital literacy skills have no significant influence on effective classroom management.*

**Table 3:** Simple Linear Regression Analysis of Teachers' Digital Literacy Skills and Effective Classroom Management (N = 375)

| Model      | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | F      | Sig. (p) | Decision |
|------------|-------|----------------|-------------------------|--------|----------|----------|
| Regression | 0.628 | 0.394          | 0.392                   | 242.58 | 0.000    | Rejected |

The results presented in Table 3 revealed that teachers' digital literacy skills significantly influenced effective classroom management. The regression analysis produced a correlation coefficient ( $R = 0.628$ ), indicating a moderately strong positive relationship between teachers' digital literacy skills and effective classroom management. Furthermore, the coefficient of determination ( $R^2 = 0.394$ ) showed that 39.4% of the variation in effective classroom management was explained by teachers' digital literacy skills, while the remaining 60.6% of the variation was attributable to other factors not examined in the study. This finding demonstrates that digital literacy skills constitute an important predictor of effective classroom management among teachers in public secondary schools.

The analysis further revealed an F-value of 242.58 with a corresponding p-value of 0.000, which is lower than the established 0.05 level of significance. Based on the decision rule, the null hypothesis stating that teachers' digital literacy skills

have no significant influence on effective classroom management was rejected. It was therefore concluded that teachers' digital literacy skills have a statistically significant influence on effective classroom management. The implication of this finding is that improvements in teachers' digital literacy skills are likely to enhance their ability to organize classroom activities, integrate digital instructional resources, facilitate student engagement, manage learning effectively, and create conducive technology-supported learning environments. This underscores the need for continuous professional development programmes aimed at strengthening teachers' digital competencies to improve classroom management and instructional effectiveness in the era of Artificial Intelligence.

### Hypothesis Two

*H<sub>02</sub>: Teachers' AI pedagogical competence has no significant influence on effective classroom management.*

**Table 4:** Simple Linear Regression Analysis of Teachers' AI Pedagogical Competence and Effective Classroom Management (N = 375)

| Model      | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | F      | Sig. (p) | Decision |
|------------|-------|----------------|-------------------------|--------|----------|----------|
| Regression | 0.711 | 0.506          | 0.505                   | 381.96 | 0        | Rejected |

The result presented in Table 4 indicates that teachers' AI pedagogical competence

significantly influences effective classroom management ( $R = 0.711$ ,  $R^2 = 0.506$ ,  $F =$

381.96,  $p = 0.000$ ). The coefficient of determination ( $R^2 = 0.506$ ) implies that AI pedagogical competence explained 50.6% of the variation in effective classroom management, whereas 49.4% of the variation was attributable to other factors outside the scope of the study. Since the probability value ( $p = 0.000$ ) is less than the 0.05 level of significance, the null hypothesis was rejected. The study therefore concluded that teachers' AI pedagogical competence has a significant influence on effective classroom management.

The findings of the study revealed that teachers' digital literacy skills had a high influence on effective classroom management (Grand Mean = 3.48). Similarly, teachers' AI pedagogical competence exerted a very high influence on effective classroom management (Grand Mean = 3.54). Regression analysis further established that both variables significantly influenced effective classroom management. Digital literacy skills explained 39.4% of the variation in classroom management ( $R^2 = 0.394$ ,  $p < 0.05$ ), while AI pedagogical competence explained 50.6% of the variation ( $R^2 = 0.506$ ,  $p < 0.05$ ). These findings suggest that improving teachers' digital competence, particularly their AI pedagogical competence, is likely to enhance effective classroom management in public secondary schools.

### **Discussion of the Findings**

#### *Teachers' Digital Literacy Skills and Effective Classroom Management*

The findings of the study revealed that teachers' digital literacy skills have a high influence on effective classroom management in public secondary schools in Cross River State. The regression analysis further established that digital literacy skills significantly influence effective classroom management, leading to the rejection of the null hypothesis. This finding implies that teachers who possess adequate digital literacy skills are better equipped to organize classroom activities, deliver lessons effectively, utilize digital

instructional resources, promote learner engagement, communicate efficiently with students, and manage classroom interactions in technology-supported learning environments. The finding underscores the growing importance of digital competence as an essential professional skill for teachers in the era of Artificial Intelligence.

The finding of this study is in agreement with the work of Bond et al. (2021), who reported that teachers with strong digital competence create more interactive and learner-centred classrooms by effectively utilizing digital technologies to facilitate instruction and improve students' participation. The present finding also supports the study of Cabero-Almenara et al. (2021), who found that digital literacy enhances teachers' instructional effectiveness by enabling them to integrate digital resources into classroom activities, thereby improving classroom organization and student engagement. Both studies emphasized that teachers' ability to use digital technologies contributes significantly to creating effective teaching and learning environments.

Similarly, the result agrees with the findings of Falloon (2020), who observed that digitally competent teachers are more capable of managing technology-rich classrooms, utilizing online learning platforms, and supporting collaborative learning among students. Falloon argued that digital literacy extends beyond basic technological skills to include the pedagogical ability to apply digital tools appropriately for classroom instruction and management. This corroborates the present finding that digital literacy significantly contributes to effective classroom management.

The finding is also consistent with the study conducted by Ghomi and Redecker (2019), which established that teachers' digital competence positively influences classroom organization, instructional planning, communication, and learner assessment. According to the authors, digitally competent teachers effectively

integrate educational technologies into their teaching practices, thereby improving students' learning experiences and classroom discipline. Likewise, the finding supports Tondeur et al. (2021), who concluded that digital literacy enables teachers to adapt instructional strategies to learners' needs, improve classroom interactions, and promote active student participation through technology-enhanced learning environments.

The agreement between the present study and previous empirical studies may be attributed to the increasing integration of digital technologies into educational systems worldwide. As schools continue to adopt digital instructional resources and technology-supported learning environments, teachers' digital literacy has become indispensable for effective classroom management. Teachers who possess adequate digital competence are more likely to employ innovative teaching strategies, utilize digital learning platforms efficiently, and maintain well-organized classrooms that promote meaningful learning. The consistency of these findings further demonstrates that digital literacy is a critical determinant of effective classroom management irrespective of geographical context. Nevertheless, the present study extends existing knowledge by providing empirical evidence from public secondary schools in Cross River State, Nigeria, where relatively few studies have examined this relationship.

#### *Teachers' AI Pedagogical Competence and Effective Classroom Management*

The study further revealed that teachers' AI pedagogical competence exerts a very high influence on effective classroom management. The hypothesis testing also showed that AI pedagogical competence significantly influences effective classroom management, resulting in the rejection of the null hypothesis. This finding indicates that teachers who possess adequate knowledge and pedagogical competence in the use of Artificial Intelligence

technologies are better able to integrate AI tools into lesson delivery, personalize instruction, monitor students' learning progress, automate routine instructional tasks, provide timely feedback, and create more engaging classroom environments. The finding suggests that AI pedagogical competence has become an important professional competency required for effective classroom management in contemporary education.

The finding is in agreement with **Chiu (2023)**, who found that teachers with higher AI pedagogical competence demonstrated greater effectiveness in personalizing instruction, monitoring learners' academic progress, improving classroom organization, and integrating Artificial Intelligence into instructional delivery. Chiu concluded that AI competence significantly enhances teaching effectiveness and classroom management, which corroborates the findings of the present study. The present finding also agrees with Celik (2023), who reported that teachers possessing adequate AI pedagogical competence effectively utilized intelligent tutoring systems, AI-supported instructional resources, and automated assessment tools to improve classroom organization, learner participation, and instructional quality. Celik further established that AI competence significantly predicts teachers' classroom management effectiveness, a conclusion that is consistent with the outcome of this study.

Furthermore, the finding supports the systematic review conducted by Zawacki-Richter et al. (2019), which revealed that Artificial Intelligence technologies improve instructional planning, automated grading, learner support, classroom monitoring, and personalized feedback when teachers possess the competence required to integrate such technologies into classroom practice. The authors emphasized that the educational benefits of AI depend largely on teachers' pedagogical competence rather than the technology itself. This observation aligns

with the findings of the present study. The result is equally in agreement with Holmes et al. (2019), who found that teachers with adequate AI competence successfully employed Artificial Intelligence to monitor students' academic performance, facilitate personalized learning, improve classroom interactions, and enhance instructional decision-making. Similarly, the finding corroborates Kohnke et al. (2023), who observed that university teachers with strong AI pedagogical competence effectively utilized generative AI technologies to prepare instructional materials, provide immediate feedback, support students' learning needs, and reduce routine administrative tasks, thereby improving classroom management and teaching effectiveness.

The agreement between the present study and the reviewed empirical literature may be attributed to the transformative role that Artificial Intelligence is increasingly playing in modern education. AI technologies provide teachers with opportunities to automate repetitive instructional tasks, personalize learning experiences, analyze students' learning data, and make informed pedagogical decisions that improve classroom effectiveness. However, these benefits can only be realized when teachers possess the pedagogical competence required to integrate AI responsibly and effectively into classroom practice. While previous studies were conducted predominantly in developed countries and higher education settings, the present study contributes to the literature by providing empirical evidence that AI pedagogical competence also significantly enhances classroom management among teachers in Nigerian public secondary schools, where AI adoption is still emerging.

### **Implications of the Study**

The findings of this study have important implications for educational practice, policy, teacher professional development, and the effective integration of emerging technologies into secondary education. The

finding that teachers' digital literacy skills significantly influence effective classroom management implies that digital competence has become an indispensable component of contemporary teaching practice. Teachers who possess adequate digital skills are better positioned to organize classroom activities, utilize digital instructional resources effectively, engage learners actively, and maintain productive learning environments. This suggests that improving teachers' digital literacy will not only enhance instructional delivery but also promote better classroom management and students' learning outcomes.

The study also revealed that AI pedagogical competence significantly influences effective classroom management. This implies that Artificial Intelligence is no longer merely an emerging technological innovation but a practical instructional resource capable of transforming classroom practices. Teachers who possess AI pedagogical competence are more capable of utilizing intelligent instructional tools to personalize learning, monitor students' academic progress, provide immediate feedback, automate routine classroom tasks, and improve classroom organization. Consequently, educational institutions that invest in AI-related capacity building are likely to achieve improved teaching effectiveness and more efficient classroom management.

Furthermore, the findings imply that educational policymakers, school administrators, and teacher education institutions should prioritize continuous professional development programmes focusing on digital competence and Artificial Intelligence integration. The study also suggests that teacher preparation programmes should incorporate digital literacy and AI pedagogical competencies into their curricula to equip both pre-service and in-service teachers with the technological skills required to function effectively in AI-supported learning environments. Overall, the study reinforces the need for sustained investment in digital

infrastructure, teacher training, and educational technologies to enhance classroom management in the era of Artificial Intelligence.

### Conclusion

Based on the findings of the study, it was concluded that teachers' digital competence is a significant determinant of effective classroom management in the era of Artificial Intelligence. Specifically, teachers' digital literacy skills were found to exert a high influence on classroom management, while AI pedagogical competence demonstrated an even stronger influence on teachers' ability to organize instruction, engage learners, monitor students' progress, and effectively manage classroom activities. The study further established that both digital literacy skills and AI pedagogical competence significantly influence effective classroom management among teachers in public secondary schools in Cross River State. The findings underscore the growing importance of equipping teachers with advanced digital and AI-related competencies required for technology-driven instructional environments. Therefore, strengthening teachers' digital competence through continuous training, institutional support, and improved access to educational technologies is essential for achieving effective classroom management and improving the quality of teaching and learning in the era of Artificial Intelligence.

### Recommendations

Based on the findings of the study, the following recommendations were made:

1. Educational authorities should organize regular professional development programmes, workshops, and digital skills training to improve teachers' digital literacy and enhance their capacity to utilize digital technologies for effective classroom management.
2. Government and school administrators should provide adequate digital infrastructure,

reliable internet connectivity, and modern educational technologies that will enable teachers to effectively integrate digital resources into classroom instruction.

3. Teacher education institutions should integrate Artificial Intelligence pedagogy and digital competence into pre-service and in-service teacher education programmes to prepare teachers for AI-supported teaching and learning environments.
4. School administrators should encourage and support teachers to utilize AI-powered instructional tools such as intelligent tutoring systems, adaptive learning platforms, automated assessment applications, and AI-assisted lesson planning software to improve classroom organization and instructional effectiveness.
5. The Federal and State Ministries of Education should formulate clear policies and implementation frameworks that promote the ethical, responsible, and effective integration of Artificial Intelligence into classroom teaching and management across secondary schools.

### References

- Akpam, G. O., Adie, J. A., Udayi, E. A., & Ategwu, P. O. (2022). Conference attendance, information and communication technology and teachers' productivity in Calabar Education Zone, Cross River State, Nigeria. *International Journal of Educational Benchmark*, 2(1), 223–225.
- Atah, C. A., Akeke, M. N. G., Eunice, N., Wonah, F., Udayi, E. A., & Nwannunu, B. I. (2023). Digitalization of Business Education curriculum for the 21st century global relevance in Nigeria.
- Atah, C. A., Akeke, N. G. M., Ushie, G. B., Nwannunu, B. I., Anthony, G. B.,

- Olabisi, B. C., et al. (2023). Analysis of e-learning platform utilization and Business Education curriculum content delivery in Rivers State universities, Nigeria. *Innovations*, 74, 1476–1479.
- Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, 18(50).
- Bond, M., Bedenlier, S., Marín, V. I., & Händel, M. (2021). Emergency remote teaching in higher education: Mapping the first global online semester. *International Journal of Educational Technology in Higher Education*, 18(1), 50.
- Cabero-Almenara, J., Barroso-Osuna, J., Gutiérrez-Castillo, J. J., & Palacios-Rodríguez, A. (2021). The teaching digital competence of health sciences teachers. *International Journal of Environmental Research and Public Health*, 18(5), 2552.
- Cabero-Almenara, J., Barroso-Osuna, J., Palacios-Rodríguez, A., & Llorente-Cejudo, C. (2021). Digital competence frameworks for teachers: A systematic review. *Sustainability*, 13(20), 11283.
- Celik, I. (2023). Towards intelligent-TPACK: An empirical study on teachers' professional knowledge to ethically integrate artificial intelligence into education. *Computers in Human Behavior*, 138, 107468.
- Chiu, T. K. F. (2023). The impact of AI literacy, AI pedagogical competence, and teacher readiness on artificial intelligence integration in education. *Education and Information Technologies*, 28(10), 12845–12868.
- Emmer, E. T., & Sabornie, E. (2015). *Handbook of classroom management* (2nd ed.). Routledge.
- Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency framework. *Educational Technology Research and Development*, 68(5), 2449–2472.
- Ghomi, M., & Redecker, C. (2019). Digital competence of educators (DigCompEdu): Development and evaluation of a self-assessment instrument for teachers' digital competence. *Proceedings of the 11th International Conference on Computer Supported Education*, 541–548.
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.
- Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). Exploring generative artificial intelligence preparedness among university teachers: The case of ChatGPT. *Computers and Education: Artificial Intelligence*, 5, 100156.
- Okpa, A. E., Udida, L. A., Ebuara, V. O., & Udayi, E. A. (2021). Digital technologies penetration and self-sufficient graduate in Nigerian universities. *Nigerian Journal of Educational Administration and Planning*, 21(4), 423–441.
- Okpa, O. E., Omorobi, G. O., & Udayi, E. O. (2025). Organizational behaviour in higher education institutions in Nigeria. *Kashere Journal of Education*, 8(1), 368–378.
- Osim, R. O., Omorobi, G. O., Ogar, E. U., & Adie, J. A. (2023). Assessment of lecturers' compliance rate with COVID-19 safety protocols using innovative educational teaching technologies in universities in Cross River State. *International Journal of Educational Research*, 12(1), 86–95.
- Redecker, C. (2017). *European framework for the digital competence of educators* (DigCompEdu).

Publications Office of the European Union.

Tondeur, J., Howard, S. K., & Yang, J. (2021). One-size does not fit all: Towards an adaptive model to develop preservice teachers' digital competencies. *Computers in Human Behavior, 116*, 106659.

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education, 16*(39), 1–27.