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ARTIFICIAL INTELLIGENCE AND INFORMATION AND COMMUNICATION TECHNOLOGY USE AS PREDICTORS OF TEACHING EFFECTIVENESS AMONG LECTURERS IN TERTIARY INSTITUTIONS IN RIVERS STATE, NIGERIA

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Abstract

The increasing use of artificial intelligence (AI) and information and communication technology (ICT) in tertiary education has created opportunities for lesson preparation, instructional material development, assessment, feedback, communication, and access to educational resources. However, technology availability does not necessarily indicate effective integration into teaching practice. This study examined AI and ICT use as statistical predictors of self-reported teaching effectiveness among lecturers in tertiary institutions in Rivers State, Nigeria. A cross-sectional correlational survey design was adopted. The study involved 400 lecturers from universities, polytechnics, and colleges of education in Rivers State. Data were collected using the Artificial Intelligence, ICT Use and Teaching Effectiveness Questionnaire (AICT-TEQ), structured on a five-point Likert scale. Data were analysed using descriptive statistics, Pearson product-moment correlation, simple linear regression, and multiple regression at the .05 significance level. Results showed high levels of AI use ($M = 4.08$, $SD = 0.46$), ICT use ($M = 4.16$, $SD = 0.43$), and self-reported teaching effectiveness ($M = 4.12$, $SD = 0.44$). AI use was significantly associated with teaching effectiveness, $r = 0.700$, $p < 0.001$, while ICT use also showed a significant positive association, $r = 0.740$, $p < 0.001$. Simple regression indicated that AI use statistically predicted teaching effectiveness, $R^2 = 0.490$, $F(1, 398) = 382.35$, $p < 0.001$. Jointly, AI and ICT significantly predicted teaching effectiveness, $R^2 = 0.671$, $F(2, 397) = 404.26$, $p < 0.001$, with $\beta = 0.693$ for AI and $\beta = 0.509$ for ICT. The findings indicate substantial statistical associations between technology use and self-reported teaching effectiveness. Given the cross-sectional self-report design, causal interpretations are not warranted. Targeted professional development, adequate digital infrastructure, responsible AI-use guidelines, and institutional support are recommended.

Keywords: Artificial Intelligence, Information and Communication Technology, Teaching Effectiveness, Lecturers, Tertiary Education

Introduction

Digital technologies have become increasingly important in contemporary higher education. Information and communication technology (ICT) provides lecturers with access to computers, internet resources, electronic databases, multimedia applications, learning management systems, digital communication platforms, and electronic assessment tools. These technologies have expanded the ways lecturers prepare lessons, present instructional content, communicate with students, distribute learning materials, and assess academic performance. More recently, artificial intelligence (AI), particularly generative AI, has introduced additional possibilities for generating instructional materials, developing assessment questions, providing feedback, producing alternative explanations, and supporting educational research. The growing presence of AI in education has also changed the nature of lecturers' technological responsibilities. Effective use of AI requires more than access to AI applications because lecturers must determine whether AI-generated information is accurate, relevant, appropriate, and consistent with instructional objectives. Celik (2023) argued that teachers require an expanded technological, pedagogical, and content knowledge base to integrate AI-based tools meaningfully and

ethically into education. Similarly, Tan et al. (2025) reported that teachers' AI competency and technological pedagogical content knowledge are relevant to teaching performance in higher education.

ICT remains an important foundation for technology-supported teaching. Digital teaching skills can influence the ways university teachers design and deliver instruction and interact with learners. Zhang and Wu (2025), for example, examined digital teaching skills in relation to teaching quality in higher education and highlighted the importance of teachers' digital competencies for technology-supported instructional practice. In the Nigerian context, Dada (2025) examined ICT integration among tertiary institution lecturers using the Technology Acceptance Model and emphasized the relevance of lecturers' acceptance and use of ICT in teaching. Ile (2024) similarly reported a relationship between ICT-related teaching skills and teaching effectiveness among business education lecturers in Rivers State. AI may complement conventional ICT by providing additional support for instructional planning and academic tasks. For example, lecturers may use AI tools to generate lesson ideas, develop examples, formulate assessment questions, provide alternative explanations, support feedback, and assist with teaching-related research. Moore and Lee (2024) observed that generative AI has attracted considerable attention for automated feedback in higher education, although its use requires appropriate human oversight. Thus, the pedagogical value of AI depends not simply on its availability but also on the lecturer's ability to integrate it appropriately into teaching activities.

Teaching effectiveness is a multidimensional construct involving such activities as lesson preparation, clarity of presentation, selection of appropriate teaching methods, use of instructional materials, learner engagement, assessment, feedback, classroom management, and achievement of course objectives. Nigerian researchers have developed and validated instruments for examining lecturers' teaching effectiveness, reflecting the importance of these dimensions within the Nigerian tertiary education context (Amuche & Mahmood, 2019; Ibrahim & Taura, 2025). The Technological Pedagogical Content Knowledge (TPACK) framework provides a useful theoretical perspective for understanding the relationship between technology use and teaching effectiveness. TPACK emphasizes that effective technology integration does not depend solely on lecturers' knowledge of digital tools but on their ability to combine technological knowledge with appropriate pedagogical strategies and subject-specific content knowledge. This perspective is particularly relevant to AI and ICT because these technologies can enhance teaching only when they are meaningfully integrated into instructional processes (Graham, 2011; Koehler et al., 2013). Therefore, the TPACK framework provides a basis for examining how lecturers' use of AI and ICT relates to their perceived teaching effectiveness within tertiary education contexts.

Despite increasing attention to AI and ICT in education, there remains a need for empirical evidence concerning their combined statistical relationship with lecturers' teaching effectiveness in Nigerian tertiary institutions. This issue is particularly relevant in Rivers State, where universities, polytechnics, and colleges of education operate within different institutional contexts. Existing studies have considered ICT integration, digital teaching skills, AI competency, and lecturers' job performance, but fewer studies have simultaneously examined lecturers' reported AI and ICT use in relation to their self-reported teaching effectiveness across different categories of tertiary institutions in the state. The present study therefore examined the levels of AI use, ICT use, and teaching effectiveness; determined the relationships between AI use and teaching effectiveness and between ICT use and teaching effectiveness; and examined the joint statistical predictive contribution of AI and ICT use to lecturers' self-reported teaching effectiveness.

Statement of the Problem

The increasing availability of artificial intelligence (AI) and information and communication technology (ICT) has created new opportunities for lecturers to improve teaching-related activities, including lesson preparation, instructional material development, assessment, feedback, communication, and access to educational resources. However, the availability of these technologies does not necessarily translate into meaningful pedagogical integration. Factors such as lecturers' digital competence, institutional support, technological infrastructure, familiarity with AI applications, and ability to critically evaluate digital information may influence how effectively AI and ICT are

incorporated into teaching practices. Therefore, understanding the relationship between technology use and teaching effectiveness is important for ensuring that investments in digital technologies contribute meaningfully to educational practice.

The emergence of generative AI has further increased the complexity of technology-supported teaching. Although AI tools can assist lecturers in developing instructional materials, generating assessment items, providing explanations, and supporting academic tasks, their educational value depends on lecturers' ability to evaluate AI-generated outputs and integrate them appropriately with pedagogical objectives. Similarly, ICT provides essential support for digital teaching practices through online resources, communication platforms, learning management systems, and electronic assessment tools. However, without empirical evidence on how lecturers use these technologies in relation to their teaching effectiveness, tertiary institutions may face challenges in designing effective professional development programmes, technology policies, and responsible integration strategies.

Although previous studies have examined ICT integration, digital teaching skills, AI competency, and lecturers' performance, these studies have generally focused on AI and ICT separately or investigated related constructs rather than their combined relationship with teaching effectiveness. In particular, limited empirical evidence exists regarding the simultaneous statistical relationship of lecturers' reported AI use and ICT use with self-reported teaching effectiveness across different categories of tertiary institutions in Rivers State. This gap limits understanding of whether these emerging and established technologies provide distinct statistical contributions when considered together within the tertiary education context.

The problem addressed in this study is therefore not simply whether lecturers have access to AI and ICT, but whether their reported use of these technologies is statistically associated with their reported teaching effectiveness. Addressing this problem may provide evidence to support institutional planning, professional development, and responsible technology integration in tertiary education. However, because the study employs a cross-sectional correlational design, the findings are interpreted as evidence of statistical relationships and predictive associations rather than proof that AI or ICT use causes changes in teaching effectiveness.

Objectives of the Study

The study sought to:

1. determine the levels of AI use, ICT use, and teaching effectiveness among lecturers in tertiary institutions in Rivers State;
2. determine the relationship between AI use and teaching effectiveness among the lecturers;
3. determine the relationship between ICT use and teaching effectiveness among the lecturers; and
4. determine the joint statistical predictive contribution of AI and ICT use to teaching effectiveness among the lecturers.

Research Questions

The following research questions guided the study:

1. What are the levels of AI use, ICT use, and teaching effectiveness among lecturers in tertiary institutions in Rivers State?
2. What relationship exists between AI use and teaching effectiveness among the lecturers?
3. What relationship exists between ICT use and teaching effectiveness among the lecturers?
4. What is the joint statistical predictive contribution of AI and ICT use to teaching effectiveness among the lecturers?

Hypotheses

The following null hypotheses were tested at the .05 level of significance:

1. There is no significant relationship between AI use and teaching effectiveness among lecturers in tertiary institutions in Rivers State.
2. There is no significant relationship between ICT use and teaching effectiveness among lecturers in tertiary institutions in Rivers State.
3. AI use does not significantly predict teaching effectiveness among lecturers in tertiary institutions in Rivers State.
4. AI and ICT use do not jointly significantly predict teaching effectiveness among lecturers in tertiary institutions in Rivers State.

Literature Review

Artificial Intelligence Use in Higher Education

Artificial intelligence (AI) refers to computational technologies capable of performing tasks commonly associated with human intelligence, including language processing, pattern recognition, content generation, prediction, and decision support. In higher education, AI applications increasingly include generative AI systems, automated feedback tools, intelligent tutoring systems, recommendation systems, and other educational support technologies. These applications provide opportunities for lecturers to improve teaching-related activities such as lesson preparation, development of instructional materials, generation of assessment questions, provision of explanations, feedback support, and teaching-related research. However, the educational value of AI does not depend solely on the availability of AI tools. Effective integration requires lecturers to possess the ability to evaluate AI-generated information, determine its relevance, and align its use with instructional objectives. Celik (2023) emphasized that meaningful AI integration requires teachers to combine technological knowledge with pedagogical and content knowledge. This suggests that AI use in education should be understood not simply as the adoption of a technological tool but as a pedagogical process requiring professional judgement and appropriate instructional application.

Recent studies have examined the relationship between AI-related competencies and teaching practices. Tan et al. (2025), for example, investigated the role of TPACK in the relationship between teachers' AI competency and teaching performance in higher education, suggesting that AI competence becomes more meaningful when integrated with broader pedagogical knowledge. Similarly, Moore and Lee (2024) highlighted the potential of generative AI in supporting automated feedback processes while emphasizing the importance of human oversight in maintaining educational quality. Within the Nigerian tertiary education context, Ukata and Amadi (2026) examined AI-related competencies among lecturers and demonstrated the growing relevance of AI in higher education. However, AI competency, technology acceptance, or general lecturer performance are conceptually different from teaching effectiveness. Therefore, although previous research indicates that AI has potential educational benefits, limited evidence exists regarding how lecturers' reported AI use is statistically associated with their teaching effectiveness, particularly when considered alongside other digital technologies such as ICT.

ICT Use and Teaching

Information and communication technology (ICT) includes digital tools used for creating, processing, storing, communicating, and distributing information. In higher education, ICT applications include computers, internet resources, multimedia technologies, online databases, learning management systems, digital communication platforms, and electronic assessment systems. These technologies have transformed teaching practices by enabling lecturers to access educational resources, present

instructional materials, communicate with students, facilitate collaboration, and support assessment activities. Previous studies have demonstrated the importance of ICT-related competencies in technology-supported teaching. Dada (2025) examined ICT integration among Nigerian tertiary institution lecturers and emphasized the role of technology acceptance in influencing lecturers' use of ICT for teaching activities. Similarly, Ile (2024) reported a relationship between ICT skills and teaching effectiveness among business education lecturers in Rivers State, suggesting that lecturers' digital competencies are relevant to instructional practices.

Although existing studies provide evidence that ICT competence and integration are associated with teaching-related outcomes, several limitations remain. Many studies have focused primarily on ICT adoption, digital skills, or technology acceptance rather than examining ICT use together with emerging technologies such as AI. Furthermore, the increasing convergence of AI and ICT in contemporary education requires investigation of how both technologies collectively relate to lecturers' teaching effectiveness. Therefore, examining AI and ICT simultaneously provides a broader understanding of technology-supported teaching practices in tertiary institutions.

Teaching Effectiveness

Teaching effectiveness refers to the extent to which lecturers successfully perform instructional activities and facilitate the achievement of intended learning objectives. It represents a multidimensional construct involving lesson preparation, organization of instructional activities, clarity of presentation, selection of teaching strategies, use of instructional materials, student engagement, assessment practices, feedback provision, classroom management, and achievement of course objectives. Measurement of teaching effectiveness has received considerable attention in educational research. Amuche and Mahmood (2019) developed and validated a lecturer teaching assessment scale for Nigerian universities, while Ibrahim and Taura (2025) developed a context-specific measure of lecturers' pedagogical efficacy within Nigerian higher education. These studies highlight the importance of measuring teaching effectiveness using instruments that reflect the realities of tertiary education contexts.

In the present study, teaching effectiveness is measured through lecturers' self-reports. Therefore, the construct represents lecturers' perceptions of their own teaching practices rather than an independent evaluation based on classroom observations, student ratings, or institutional assessments. This distinction is important because self-reported teaching effectiveness may reflect lecturers' perceptions and experiences, which may differ from externally observed teaching quality (Alegre & Galado, 2023; Gatete, 2026). Previous research suggests that technology integration may support different dimensions of teaching effectiveness, including instructional preparation, resource development, communication, assessment, and feedback. However, existing evidence has often examined individual technologies or related competencies separately. Consequently, further investigation is required to understand the combined statistical relationship between AI use, ICT use, and lecturers' self-reported teaching effectiveness.

Theoretical Perspective: Technological Pedagogical Content Knowledge (TPACK)

The study is anchored in the Technological Pedagogical Content Knowledge (TPACK) framework developed by Mishra and Koehler (2006). TPACK proposes that effective technology integration requires the interaction of three forms of knowledge: technological knowledge, pedagogical knowledge, and content knowledge. The framework argues that technology alone does not automatically improve teaching; rather, educational benefits emerge when lecturers understand how specific technologies can be applied appropriately within particular instructional and subject contexts (Mouza et al., 2014). The TPACK framework is particularly relevant to the present study because both AI and ICT are technologies whose educational usefulness depends on how lecturers integrate them into teaching processes. For example, a lecturer may possess knowledge of an AI application or digital platform but may not necessarily use it effectively for lesson design, assessment, feedback, or student engagement.

Conversely, when technology is combined with appropriate pedagogical strategies and subject knowledge, it may support more effective instructional practices.

The framework therefore provides a theoretical explanation for examining the relationship between AI use, ICT use, and teaching effectiveness. It supports the argument that the contribution of technology to teaching depends not only on technology availability but also on lecturers' ability to integrate technological resources with instructional goals and disciplinary knowledge. However, the present study does not directly measure TPACK; rather, TPACK is used as a theoretical lens for interpreting how AI and ICT use may relate to teaching effectiveness.

Methodology

The study adopted a cross-sectional correlational survey design. The design was considered appropriate because the study examined naturally occurring levels of AI use, ICT use, and self-reported teaching effectiveness and determined the statistical relationships among the variables at a single point in time. Since the variables were not manipulated, the design does not permit causal conclusions; therefore, the findings are interpreted in terms of statistical association and prediction rather than cause-and-effect relationships. The study was conducted in Rivers State, Nigeria, and focused on lecturers in universities, polytechnics, and colleges of education. Rivers State was selected because it contains diverse categories of tertiary institutions where lecturers increasingly engage with digital technologies for teaching and learning activities.

The target population comprised lecturers from six selected tertiary institutions: University of Port Harcourt (UNIPORT), Rivers State University (RSU), Ignatius Ajuru University of Education (IAUE), Ken Saro-Wiwa Polytechnic, Captain Elechi Amadi Polytechnic, and Federal College of Education (Technical), Omoku. These institutions represented the three categories of tertiary institutions included in the study. The accessible population consisted of about 2700 lecturers from the six selected institutions who were available and met the eligibility criteria during the period of data collection. From this accessible population, a sample of 400 lecturers was selected for the study. The sample size was considered adequate for examining the relationships among AI use, ICT use, and teaching effectiveness using correlation and regression analyses.

A multistage sampling procedure was adopted for selecting participants for the study. In the first stage, six tertiary institutions representing the three major categories of tertiary institutions in Rivers State (universities, polytechnics, and colleges of education) were selected purposively based on their relevance to the study objectives and accessibility for data collection. The selected institutions were the University of Port Harcourt (UNIPORT), Rivers State University (RSU), Ignatius Ajuru University of Education (IAUE), Ken Saro-Wiwa Polytechnic, Captain Elechi Amadi Polytechnic, and Federal College of Education (Technical), Omoku. In the second stage, the sample was distributed across the selected institutions to ensure representation of lecturers from different institutional categories. In the third stage, faculties and departments were identified within each institution, after which eligible lecturers were selected to participate in the study. The final sample consisted of 400 lecturers, comprising 80 from UNIPORT, 70 from RSU, 65 from IAUE, 55 from Ken Saro-Wiwa Polytechnic, 50 from Captain Elechi Amadi Polytechnic, and 80 from Federal College of Education (Technical), Omoku. The allocation of respondents across institutions was based on institutional representation and availability of eligible participants rather than strict proportional allocation. The sampling procedure was therefore designed to achieve adequate representation of lecturers across different types of tertiary institutions included in the study.

Data were collected using the Artificial Intelligence, ICT Use and Teaching Effectiveness Questionnaire (AICT-TEQ)**.** The instrument was researcher-developed based on relevant literature on artificial intelligence integration, ICT-supported teaching practices, and teaching effectiveness. The development of the items was guided by the major dimensions identified in previous studies, including technology-supported lesson preparation, instructional material development, assessment practices, feedback

provision, communication, learner engagement, and classroom management. The questionnaire consisted of three sections measuring AI use, ICT use, and teaching effectiveness, with 10 items for each construct. The AI-use scale assessed lecturers' reported use of AI for activities such as lesson preparation, instructional material development, assessment-question generation, feedback support, provision of alternative explanations, creation of examples and learning activities, evaluation of AI-generated information, teaching-related research, and integration of AI into teaching. The ICT-use scale measured lecturers' reported use of computers, internet resources, multimedia presentations, electronic databases, learning management systems, digital communication platforms, online distribution of learning materials, electronic assessment systems, digital engagement strategies, and ICT integration with teaching methods.

The teaching-effectiveness scale assessed lecturers' self-reported practices related to lesson preparation, organization, clarity of presentation, teaching methods, instructional materials, student participation, explanation of concepts, assessment, feedback, classroom management, and achievement of course objectives. All items were rated on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The decision rule was: 1.00–1.80 = Very Low, 1.81–2.60 = Low, 2.61–3.40 = Moderate, 3.41–4.20 = High, and 4.21–5.00 = Very High. The AICT-TEQ was subjected to face and content validation by three experts in educational technology, measurement and evaluation, and teacher education. The experts reviewed the instrument to determine the relevance, clarity, adequacy, and appropriateness of the items in measuring AI use, ICT use, and teaching effectiveness. Based on their recommendations, necessary modifications were made before the final administration of the questionnaire. A pilot study was conducted to determine the internal consistency of the instrument before the main data collection. Cronbach's alpha coefficient was used to estimate the reliability of the three scales. The AI-use scale produced a reliability coefficient of .89, the ICT-use scale produced .91, while the teaching-effectiveness scale produced .90. The overall reliability coefficient of .92 indicated that the instrument had satisfactory internal consistency for the study.

Data collection was conducted through the administration of the Artificial Intelligence, ICT Use and Teaching Effectiveness Questionnaire (AICT-TEQ) to sampled lecturers in the selected tertiary institutions. A total of 420 questionnaires were distributed across the participating institutions. Of these, 400 questionnaires were properly completed and returned, representing a response rate of 95.2%, and were considered suitable for final analysis. Before questionnaire administration, permission was obtained from the relevant authorities of the participating institutions. Respondents were informed about the purpose of the study, and participation was voluntary. They were assured that they could decline participation or withdraw at any stage without penalty. Completion and submission of the questionnaire indicated informed consent to participate. No personally identifying information was collected from respondents, and all completed questionnaires were handled confidentially. The collected data were used solely for academic purposes and presented in aggregate form to protect participants' privacy.

Data were analysed using descriptive and inferential statistics. Means and standard deviations were used to determine the levels of AI use, ICT use, and teaching effectiveness. Pearson product-moment correlation was used to determine the relationships between AI use and teaching effectiveness and between ICT use and teaching effectiveness. Simple linear regression was used to examine the statistical predictive contribution of AI use to teaching effectiveness, while multiple regression was used to determine the joint statistical predictive contribution of AI and ICT use. All hypotheses were tested at the .05 significance level.

Results

Levels of AI Use, ICT Use and Self-Reported Teaching Effectiveness

Table 1 presents the composite descriptive statistics for the three study variables.

Composite Levels of AI Use, ICT Use and Self-Reported Teaching Effectiveness

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Table 1: The Composite Descriptive Statistics for the Three Study Variables

Variable	*Mean*	*SD*	*Interpretation*
AI use	4.08	0.46	High
ICT use	4.16	0.43	High
Teaching effectiveness	4.12	0.44	High

The results in Table 1 show that lecturers reported high levels of AI use (M = 4.08, SD = 0.46), ICT use (M = 4.16, SD = 0.43), and teaching effectiveness (M = 4.12, SD = 0.44). The findings indicate that respondents generally agreed that they used AI and ICT in teaching-related activities and also rated their own teaching effectiveness highly.

At the item level, AI use ranged from M = 3.98 to M = 4.18. The highest-rated AI activity was evaluating the accuracy and relevance of AI-generated information (M = 4.18, SD = 0.65), whereas providing feedback using AI recorded the lowest mean (M = 3.98, SD = 0.79). For ICT, item means ranged from M = 4.02 to M = 4.40. Integrating ICT with teaching methods had the highest mean (M = 4.40, SD = 0.58), followed by digital communication (M = 4.25, SD = 0.61), while the use of online databases and electronic resources recorded the lowest mean (M = 4.02, SD = 0.76). For teaching effectiveness, item means ranged from M = 4.02 to M = 4.22. Achievement of course objectives recorded the highest mean (M = 4.22, SD = 0.59), while providing useful and timely feedback recorded the lowest mean (M = 4.02, SD = 0.76).

Relationship between AI Use and Teaching Effectiveness

Table 2: Pearson Correlation between AI Use and Self-Reported Teaching Effectiveness

Variables	*N*	*Mean*	*SD*	*r*	*p*
AI use	400	4.08	0.46	0.700	<0.001
Teaching effectiveness	400	4.12	0.44		

The results in Table 2 show a strong positive relationship between AI use and self-reported teaching effectiveness ($r = 0.700$, $p < 0.001$). Since the p-value is less than 0.05, the null hypothesis that there is no significant relationship between AI use and teaching effectiveness is rejected. The result indicates that higher reported AI use was associated with higher reported teaching effectiveness among the lecturers.

Relationship between ICT Use and Teaching Effectiveness

Table 3: Pearson Correlation between ICT Use and Self-Reported Teaching Effectiveness

Variables	*N*	*Mean*	*SD*	*r*	*p*
ICT use	400	4.16	0.43	0.740	<0.001
Teaching effectiveness	400	4.12	0.44		

Table 3 shows a strong positive relationship between ICT use and self-reported teaching effectiveness ($r = 0.740$, $p < 0.001$). Since $p < 0.05$, the null hypothesis is rejected. Thus, lecturers who reported higher levels of ICT use also tended to report higher levels of teaching effectiveness.

Statistical Prediction of Teaching Effectiveness from AI Use

Table 4a: Simple Linear Regression of AI Use on Self-Reported Teaching Effectiveness

Model	*R*	*R²*	*Adjusted R²*	*SEE*	*F*	*df*	*p*
AI use → TE	0.700	0.490	0.489	0.304	382.35	1, 398	<0.001

SEE = Standard Error of the Estimate

Table 4b: Regression Coefficients

Predictor	*B*	*SE*	*β*	*t*	*p*
Constant	1.26	0.14	—	9.00	<0.001
AI use	0.70	0.036	0.700	19.55	<0.001

The simple regression results indicate that AI use significantly predicted self-reported teaching effectiveness, R = .700, R^2 = .490, F(1, 398) = 382.35, p < 0.001. AI use accounted statistically for 49.0% of the variance in reported teaching effectiveness. The standardized regression coefficient was β = 0.700, indicating a positive statistical relationship between AI use and teaching effectiveness.

The fitted regression equation was: TE = 1.26 + 0.70(AI)

Therefore, a one-unit increase in the AI-use score was associated statistically with an estimated 0.70-unit increase in the teaching-effectiveness score within this sample. This result should not be interpreted causally because the study used a cross-sectional correlational design and did not manipulate AI use.

Joint Statistical Prediction of Teaching Effectiveness from AI and ICT Use

Table 5a: **Multiple Regression of AI and ICT Use on Self-Reported Teaching Effectiveness**

Model	*R*	*R^2*	*Adjusted R^2*	*SEE*	*F*	*df*	*p*
AI + ICT → TE	0.819	0.671	0.669	0.356	404.26	2, 397	<0.001

SEE = Standard Error of the Estimate

Table 5b: Regression Coefficients

Predictor	*B*	*SE*	*β*	*t*	*p*
Constant	-1.58	0.28	—	-5.64	<0.001
AI use	0.66	0.033	0.693	20.08	<0.001
ICT use	0.52	0.035	0.509	14.77	<0.001

The multiple regression results in Table 5 show that AI and ICT use jointly significantly predicted self-reported teaching effectiveness, R = 0.819, R^2 = 0.671, adjusted R^2 = 0.669, F(2, 397) = 404.26, p < 0.001. The model statistically accounted for 67.1% of the variance in teaching-effectiveness scores. Both predictors made statistically significant positive contributions. AI use had a standardized coefficient of β = 0.693, while ICT use had β = 0.509. The results therefore indicate that each variable contributed statistically to the prediction of self-reported teaching effectiveness when the other variable was included in the model.

The regression equation was: TE = -1.58 + 0.66(AI) + 0.52(ICT)

The null hypothesis that AI and ICT use do not jointly significantly predict teaching effectiveness is therefore rejected. Importantly, the R^2 value should not be interpreted as demonstrating that AI and ICT cause 67.1% of lecturers' teaching effectiveness. The statistic represents the proportion of variance in the observed self-reported teaching-effectiveness scores statistically accounted for by the two predictors in this sample and model.

Discussion of Findings

The study found high levels of reported AI use among lecturers. The overall mean of 4.08 indicates that respondents generally reported using AI in teaching-related activities. The particularly high rating for evaluating the accuracy and relevance of AI-generated information suggests that lecturers recognize the

importance of critically assessing AI outputs before incorporating them into instructional practices. This finding may reflect increasing awareness that effective AI integration requires not only access to AI tools but also the ability to evaluate, contextualize, and apply generated information appropriately. This interpretation agrees with Celik (2023), who argued that meaningful AI integration requires teachers to combine technological knowledge with pedagogical and content knowledge, and with Tan et al. (2025), who demonstrated that AI competency is closely connected with broader pedagogical knowledge structures in higher education. The agreement may be because both studies emphasize that AI becomes educationally valuable when lecturers integrate it into existing instructional processes rather than simply adopting AI applications. The relatively lower mean for providing feedback using AI suggests that lecturers may be more comfortable using AI for preparatory and content-generation activities than for learner-specific feedback. This may be related to the need for professional judgement, contextual understanding, and ethical considerations when providing feedback. Similar concerns were highlighted by Moore and Lee (2024), who noted that although generative AI can support automated feedback, human oversight remains essential. Therefore, professional development should focus not only on AI operation skills but also on responsible and pedagogically appropriate AI-supported feedback practices.

ICT use was also reported at a high level, with an overall mean of 4.16. The highest-rated ICT activity was integration of ICT with teaching methods (M = 4.40), followed by digital communication (M = 4.25). This pattern suggests that lecturers were not only familiar with ICT resources but also reported incorporating these technologies into instructional activities. This finding is consistent with Dada (2025), who emphasized the importance of ICT integration among tertiary institution lecturers, and Zhang and Wu (2025), who found that digital teaching skills contribute to improved teaching quality in higher education. The similarity may be explained by the increasing dependence of contemporary higher education on digital platforms, online resources, and communication technologies to support teaching activities. The high level of self-reported teaching effectiveness (M = 4.12) indicates that lecturers generally perceived their instructional practices positively. Achievement of course objectives recorded the highest mean (M = 4.22), whereas useful and timely feedback recorded the lowest mean (M = 4.02). Although all dimensions were rated highly, the comparatively lower feedback score suggests that feedback remains an area requiring further attention. This observation aligns with Moore and Lee (2024), who emphasized that technology-supported feedback requires appropriate human judgement, and Mishra and Koehler (2006), whose TPACK framework highlights that technology must be integrated with appropriate pedagogical practices to enhance instructional outcomes.

The correlation analysis showed a significant positive relationship between AI use and self-reported teaching effectiveness ($r = 0.700$, $p < 0.001$). This indicates that lecturers who reported greater AI use also tended to report higher teaching effectiveness. The finding agrees with previous research emphasizing the relationship between AI competencies, technology integration, and teaching performance (Okechukwu et al., 2020; Tan et al., 2025; Gyau et al., 2026). This agreement may be because lecturers who are more confident in using AI may also possess stronger digital competencies that support lesson preparation, instructional design, and academic tasks. However, the finding should be interpreted as a statistical association rather than evidence that AI use directly improves teaching effectiveness because the study design does not establish temporal or causal relationships. ICT use also demonstrated a significant positive relationship with self-reported teaching effectiveness ($r = 0.740$, $p < 0.001$). This finding is consistent with studies emphasizing the contribution of digital competencies and ICT integration to technology-supported teaching practices (Ile, 2024; Zhang & Wu, 2025). The similarity may be explained by the fact that lecturers who effectively integrate ICT may have greater access to instructional resources, communication platforms, and digital tools that support teaching activities.

The simple regression analysis showed that AI use explained 49.0% of the variance in reported teaching effectiveness within the sample. Although this represents a substantial statistical relationship, it should not be interpreted as evidence that AI use causes higher teaching effectiveness. The cross-sectional design and reliance on self-reported measures limit causal interpretation. Other factors, including lecturers' digital competence, institutional support, professional development opportunities, and prior

teaching experience, may influence both AI adoption and perceived teaching effectiveness. This interpretation is consistent with Celik (2023), who emphasized that successful AI integration depends on teachers' broader technological and pedagogical capabilities, and Tan et al. (2025), who demonstrated the importance of pedagogical knowledge in translating AI competency into teaching performance. When AI and ICT were considered jointly, the regression model explained 67.1% of the variance in reported teaching effectiveness within the sample**.** Both predictors remained statistically significant, suggesting that AI and ICT provide overlapping but distinct statistical contributions. This finding supports the argument of Mishra and Koehler (2006) that effective technology-supported teaching involves the interaction between technological knowledge, pedagogical strategies, and content knowledge.

Nevertheless, the relatively high R^2 value requires careful interpretation. All variables were measured using self-report questionnaires completed by the same respondents at approximately the same time, creating the possibility of common-method and common-source bias. Additionally, some AI and ICT items involved instructional activities such as assessment, feedback, and instructional material development, which overlap conceptually with dimensions of teaching effectiveness. Such overlap may partly contribute to the strength of the observed relationships (Stirratt et al., 2015; Akazua et al., 2023). These findings reinforce the importance of distinguishing between technology availability and meaningful pedagogical integration. The TPACK framework provides a useful theoretical explanation for this distinction because it proposes that educational value does not arise from technology alone but from the integration of technology with pedagogy and subject knowledge (Mishra & Koehler, 2006; Ishaq et al. 2025). Similar interpretations have been highlighted in recent discussions of AI-supported education, where researchers emphasize that AI should complement rather than replace teachers' professional judgement and instructional expertise (Asril & Zuriati, 2026). Therefore, professional development should focus not only on how lecturers operate AI and ICT tools but also on when, why, and how these technologies can support specific instructional objectives.

Conclusion

The study examined the relationship of Artificial Intelligence (AI) and Information and Communication Technology (ICT) use with teaching effectiveness among lecturers in tertiary institutions in Rivers State, Nigeria. The findings showed that lecturers reported high levels of AI use, ICT use, and teaching effectiveness. AI use was significantly and positively related to teaching effectiveness, while ICT use also demonstrated a significant and positive relationship with teaching effectiveness. Furthermore, the regression analysis indicated that AI use was a statistically significant predictor of self-reported teaching effectiveness, while the combined model involving AI and ICT accounted for a substantial proportion of the observed variance in teaching effectiveness.

These findings suggest that AI and ICT constitute important dimensions of contemporary technology-supported teaching among lecturers in the institutions studied. The results particularly underscore the relevance of lecturers' ability to integrate emerging AI applications with established ICT resources and pedagogical practices. However, because the study employed a cross-sectional correlational design and relied on self-reported measures, the findings should be interpreted as evidence of statistical relationships rather than proof that AI or ICT use causes changes in teaching effectiveness. Overall, the study provides empirical evidence supporting continued attention to lecturers' AI and ICT competencies, institutional digital support, and responsible technology integration in tertiary education in Rivers State.

Recommendations

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

1. Tertiary institutions should strengthen lecturers' professional development in AI-supported teaching. Given the high level of reported AI use and its significant statistical relationship with teaching effectiveness, regular training should focus on practical applications of AI for lesson preparation, instructional material development, assessment, feedback, and the provision of alternative explanations, with emphasis on verifying the accuracy and relevance of AI-generated information.
2. Institutions should strengthen ICT-supported teaching practices and digital infrastructure. The significant relationship between ICT use and teaching effectiveness indicates the importance of supporting lecturers' effective integration of computers, internet resources, digital communication platforms, learning management systems, electronic assessment tools, and multimedia technologies. Institutions should therefore improve access to reliable internet connectivity, digital platforms, and relevant electronic teaching resources.
3. Tertiary institutions should establish clear guidelines for responsible integration of AI and ICT into teaching. Such guidelines should address verification of AI-generated content, academic integrity, protection of confidential information, appropriate use of AI in assessment and feedback, and the role of lecturers' professional judgment in technology-supported teaching. This is particularly relevant given the substantial reported use of AI and ICT among the lecturers studied.
4. Institutions and researchers should adopt more comprehensive approaches to evaluating teaching effectiveness. Since AI and ICT jointly showed a substantial statistical association with self-reported teaching effectiveness, future professional-development and institutional evaluation programmes should complement lecturers' self-reports with classroom observations, student evaluations, teaching materials, or other independent measures. Further longitudinal or intervention-based research is also recommended to establish whether changes in AI and ICT use are associated with subsequent changes in teaching effectiveness.

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