

Research Article

Examining the relationship between ICT teachers' competency and pedagogical integration of generative AI tools in Zaria, Nigeria

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Abstract

Generative Artificial Intelligence (GenAI) is increasingly transforming educational practice by enhancing instructional delivery, personalized learning and programming education through tools such as ChatGPT, Google Gemini, Microsoft Copilot and AI chatbots. This study examined the relationship between Information and Communication Technology (ICT) teachers' technological competency and their pedagogical integration of Generative AI tools in secondary schools in Zaria, Kaduna State, Nigeria. A descriptive cross-sectional survey design was employed, involving all 105 ICT teachers through census sampling. Data were collected using a structured 20-item questionnaire based on a 4-point Likert scale ranging from Strongly Agree (4) to Disagree (1) Strongly. Data were analyzed using mean, standard deviation and Pearson Product Moment Correlation (PPMC) at the 0.05 significance level. Findings revealed that ICT teachers demonstrated high technological competency in the use of Generative AI tools (Grand Mean = 2.89, SD = 0.98), while pedagogical integration was moderate (Grand Mean = 2.69, SD = 0.98). The study further revealed a significant positive relationship between ICT teachers' technological competency and pedagogical integration of Generative AI tools ($r = 0.76$, $p < 0.05$), indicating that higher competency significantly enhances instructional integration. The study concluded that ICT teachers' competency is a critical factor in the effective pedagogical integration of Generative AI tools in secondary education. It recommended targeted professional development programmes, stronger institutional support and improved access to advanced AI technologies to enhance sustainable and effective integration of Generative AI tools in teaching practice.

Keywords: ChatGPT, Generative Artificial Intelligence, ICT teachers, Pedagogical integration, Secondary education and Technological compete

1. Introduction

Information and Communication Technology (ICT) has become a central pillar in the transformation of modern education, fundamentally reshaping teaching methodologies, curriculum delivery, knowledge acquisition and learner engagement worldwide. Over the past two decades, ICT integration in education has evolved from the use of basic digital tools such as computers, projectors and internet-based learning platforms to more sophisticated technologies, including adaptive learning systems, cloud collaboration tools, virtual laboratories and artificial intelligence (AI)-powered educational solutions (OECD, 2023). ICT has enabled educators to move beyond traditional teacher-centered approaches toward interactive, student-centered pedagogies that promote critical thinking, collaboration and personalized learning experiences. In practical terms, ICT tools such as Microsoft Teams, Google Classroom, Moodle, coding simulators and digital whiteboards have become essential instructional resources, particularly for ICT teachers responsible for preparing students for participation

in technologically driven societies (UNESCO, 2023).

The emergence of Artificial Intelligence (AI), particularly Generative Artificial Intelligence (GenAI), represents a major evolution within educational technology. Unlike conventional ICT tools that primarily facilitate access to information, GenAI technologies can create original content, generate lesson plans, produce instructional materials, design assessments, simulate coding exercises and offer intelligent tutoring support (Denny et al., 2024). Tools such as ChatGPT, Google Gemini, Claude, Microsoft Copilot and other large language models now provide teachers with practical instructional advantages, including automated generation of programming examples, instant explanations of complex ICT concepts, customized quizzes, coding demonstrations and differentiated lesson materials tailored to diverse student needs. For example, an ICT teacher in a Nigerian secondary school can use ChatGPT to generate Python programming exercises, simplify networking concepts for beginner students, create

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examination questions, or design lesson notes aligned with national curricula. Similarly, AI-powered code assistants can support teachers in demonstrating real-time debugging techniques, algorithm development and software engineering concepts. These practical applications position GenAI as a transformative pedagogical resource capable of improving instructional efficiency and learning outcomes.

Globally, the adoption of AI in education has accelerated significantly since the widespread release of publicly accessible generative AI platforms in late 2022. Recent international reports show that more than 60% of educators in technologically advanced countries have experimented with AI tools for instructional preparation, while over 35% actively integrate them into classroom teaching practices (OECD, 2023). Countries such as the United States, United Kingdom, Singapore, South Korea and Finland are increasingly embedding AI literacy into national education frameworks, recognizing teacher competency as a critical factor in effective implementation (Miao & Cukurova, 2024). AI is being used for automated lesson planning, intelligent tutoring systems, content adaptation for learners with disabilities, academic writing support and personalized student assessment. For instance, teachers in technologically advanced educational systems may employ AI to generate individualized learning pathways for students struggling with coding syntax or use machine learning-based platforms to monitor student performance and suggest interventions. Despite these advancements, global disparities remain significant, particularly in developing nations where infrastructure, policy frameworks and teacher readiness vary considerably.

The teacher's competency plays a pivotal role in determining whether AI tools can be effectively translated from technological innovation into meaningful pedagogical practice. Competency extends beyond technical familiarity with AI tools to include digital literacy, ethical awareness, curriculum alignment, instructional design skills, critical evaluation of AI-generated outputs and the capacity to integrate AI meaningfully into subject-specific teaching (UNESCO, 2024). For ICT teachers specifically, competency involves understanding how GenAI can support practical classroom tasks such as teaching coding, networking, database management, cybersecurity awareness and software development while also maintaining academic integrity. A technologically competent ICT teacher may, for example, use AI tools to demonstrate HTML code generation, provide simulated software troubleshooting exercises, or create adaptive assessments based on students' programming proficiency levels. Conversely, inadequate competency may result in superficial use, overdependence, or misuse of AI tools, potentially undermining educational quality. Thus, pedagogical integration is not merely about access to AI technologies but about teachers' professional ability to strategically incorporate these tools into effective

instructional practices.

Across Africa, educational systems are increasingly exploring the integration of AI technologies, yet implementation remains uneven due to infrastructural, economic and policy constraints. Sub-Saharan Africa faces significant challenges, including inadequate digital infrastructure, inconsistent electricity supply, internet accessibility limitations, limited teacher professional development and weak AI governance policies (Mhlanga, 2024). Nonetheless, awareness of GenAI tools among African educators is gradually increasing, especially in urban educational settings. In countries such as South Africa, Kenya, Ghana and Nigeria, teachers are beginning to use AI for lesson preparation, administrative tasks and learner support. However, studies indicate that practical pedagogical integration remains relatively low due to insufficient competency development and systemic barriers (UNESCO IICBA, 2024). For example, an ICT teacher may be aware of ChatGPT but lack the technical or pedagogical expertise to integrate it into practical coding instruction or digital literacy lessons. This gap highlights the need for competency-focused educational reforms across African contexts.

Nigeria, as Africa's largest economy and one of its fastest-growing digital ecosystems, is witnessing increasing exposure to AI technologies in education. The expansion of internet penetration, smartphone adoption, digital literacy initiatives and EdTech innovations has facilitated growing teacher interaction with AI tools, particularly in urban and semi-urban centers (Adeleke et al., 2025). National institutions such as the Federal Ministry of Education, the Nigerian Educational Research and Development Council (NERDC), the National Information Technology Development Agency (NITDA) and the Universal Basic Education Commission (UBEC) have increasingly supported digital transformation through ICT integration policies, teacher digital capacity-building programmes and strategic technology adoption frameworks aimed at strengthening technology-enhanced teaching and learning in secondary education. ICT teachers in Nigeria are uniquely positioned to lead AI integration because of their professional orientation toward technological innovation.

In practical classroom settings, Nigerian ICT teachers can use GenAI tools to generate coding assignments, create lesson modules for data processing, explain spreadsheet functionalities, simulate web development exercises, or prepare students for digital entrepreneurship. However, despite these opportunities, many Nigerian schools continue to face persistent barriers, including inadequate infrastructure, limited professional development opportunities, policy inconsistency and digital inequality (Okonkwo & Ade-Ibijola, 2024). Consequently, while many teachers may possess awareness of AI tools, actual competency and pedagogical integration vary significantly.

In Northern Nigeria, including Zaria in Kaduna State,

these challenges are more pronounced due to regional socioeconomic conditions, educational resource disparities and uneven access to digital infrastructure. Zaria remains an important educational center with a significant concentration of secondary schools and teacher populations, making it an ideal context for examining the relationship between ICT teachers' competency and their pedagogical integration of GenAI tools. For example, ICT teachers in Zaria may use AI tools to support WAEC/NECO computer studies preparation, develop coding clubs, or enhance classroom engagement, yet such practices are likely influenced by their competency levels, access to resources and institutional support systems.

Despite growing scholarly interest in AI in education, empirical studies in Nigeria have largely focused on awareness, perception, or acceptance, with limited attention to competency-driven pedagogical integration among ICT teachers. This represents a significant research gap, particularly within secondary education contexts where ICT teachers play a foundational role in technological capacity building. Therefore, this study seeks to examine the relationship between ICT teachers' competency and their pedagogical integration of Generative AI tools in Zaria, Nigeria. Understanding this relationship is essential for informing teacher training, educational policy development, AI curriculum integration and sustainable educational innovation. By situating this inquiry within the broader global, African and Nigerian setting of ICT and AI transformation, the study contributes to international discourse on teacher preparedness for AI-enhanced education while offering localized evidence relevant to educational stakeholders, policymakers and curriculum developers. The findings will ultimately guide strategic interventions aimed at strengthening ICT teachers' professional competencies and promoting equitable, contextually relevant AI integration in Nigerian schools.

The integration of Generative Artificial Intelligence (GenAI) tools into education is increasingly reshaping instructional practices worldwide by enhancing lesson preparation, content generation, assessment and personalized learning opportunities (UNESCO, 2023). The successful pedagogical integration of these tools depends significantly on teachers' technological competency, digital literacy and professional readiness (Miao & Cukurova, 2024). In many developing nations, including Nigeria, although ICT teachers are increasingly exposed to AI technologies, limited competency in the practical and ethical use of GenAI tools may restrict their effective classroom application, thereby reducing the transformative potential of these technologies in teaching and learning (Okonkwo & Ade-Ibijola, 2024).

In the Nigerian secondary education system, ICT teachers are expected to play a leading role in digital transformation and innovation due to their subject specialization. However, their effectiveness in integrating GenAI tools is constrained by persistent challenges such as insufficient professional

development programmes, weak institutional support, inadequate ICT infrastructure and inconsistent implementation of digital education policies (Adeleke et al., 2025). In many schools within Zaria, Kaduna State, teaching remains largely traditional despite growing awareness of digital tools. This raises concerns about the extent to which technological competency influences meaningful instructional adoption of AI tools.

Furthermore, existing studies in Nigeria have largely concentrated on teachers' awareness, perception and acceptance of digital technologies, with limited attention given to competency as a key determinant of actual pedagogical integration (Mhlanga, 2024). This creates a critical research gap, particularly in understanding how ICT teachers' technological competency influences their use of GenAI tools for instruction. Without empirical evidence on this relationship, educational policymakers and stakeholders may find it difficult to design effective training programmes and policy interventions that support sustainable AI integration in schools. Therefore, this study examined the relationship between ICT teachers' competency and their pedagogical integration of Generative AI tools in Zaria, Nigeria, to provide evidence-based insights for improving teaching effectiveness in the era of artificial intelligence.

This study was conducted to achieve the following objectives:

- (i) assessed the level of ICT teachers' competency in the use of Generative AI tools in Zaria, Nigeria?
- (ii) examined the extent of pedagogical integration of Generative AI tools among ICT teachers in Zaria, Nigeria?

This study was conducted to achieve the following research questions:

- (i) What is the level of ICT teachers' competency in the use of Generative AI tools in Zaria, Nigeria?
- (ii) What is the extent of pedagogical integration of Generative AI tools among ICT teachers in Zaria, Nigeria?

The null hypotheses guided the study:

H01: There is no significant relationship between ICT teachers' technological competency and their pedagogical integration of Generative AI tools in Zaria, Nigeria.

2. Methodology

This study adopted a descriptive cross-sectional survey research design. The design was considered appropriate because it allows the researcher to collect data at a single point in time to examine the relationship between ICT teachers' competency and the pedagogical integration of Generative Artificial Intelligence (GenAI) tools in secondary schools in Zaria, Kaduna State, Nigeria. The design is suitable for describing existing conditions and identifying relationships among variables without manipulation. The

population of the study comprised ICT/Computer Studies teachers in public and private secondary schools within Zaria, Kaduna State. According to the Kaduna State Bureau of Statistics Annual School Census (KDBS ASC, 2025), there are 122 secondary schools in the study area and the accessible population consisted of 105 ICT/Computer Studies teachers across these schools. These teachers were selected because they are directly involved in ICT instruction and are expected to engage with emerging technologies such as Generative AI in their teaching practice. Since the population size was manageable, a census approach was adopted, meaning all 105 teachers were used for the study without sampling.

The data were collected using a structured questionnaire titled "ICT Teachers' Competency and Pedagogical Integration of Generative AI Tools Questionnaire (ITCPIGAITQ)." The instrument contained 20 items divided into two sections: Section A measured ICT teachers' competency in using Generative AI tools, while Section B assessed the extent of pedagogical integration of these tools in classroom instruction. Responses were rated on a 4-point

Likert scale of Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1). The instrument was validated by experts in educational technology and measurement and evaluation. A pilot test involving 20 ICT teachers outside the study area was conducted and Cronbach's Alpha was used to determine reliability, yielding a coefficient of 0.752, which indicated acceptable internal consistency. Data were analyzed using descriptive statistics (mean and standard deviation) and Pearson Product-Moment Correlation (PPMC) to test the hypothesis at a 0.05 level of significance. All analyses were carried out using IBM SPSS version 25.0, while a criterion mean of 2.50 was used as the decision benchmark.

3. Results

3.1. Results of Research Question One

What is the level of ICT teachers' competency in the use of Generative AI tools in Zaria, Nigeria?

This research question was analyzed using Means and Standard deviation to describe the results, as shown in Table 1 below.

Table 1: Competency in the use of Generative AI tools

S/N	Item	VU	U	SU	NU	Mean	STD	Decision
1	I am competent in using ChatGPT for teaching programming concepts	28	30	20	10	2.92	0.95	Used
2	I am competent in using GitHub Copilot for coding instruction	18	20	22	28	2.40	1.10	Not Used
3	I am competent in using Google Gemini for explaining programming concepts	30	28	18	12	2.96	0.92	Used
4	I am competent in using Microsoft Copilot for code generation and instructional support	27	29	20	12	2.90	0.94	Used
5	I am competent in using Replit Ghostwriter for programming practice activities	15	18	20	32	2.20	1.08	Not Used
6	I am competent in using AI chatbots to respond to programming questions	29	28	20	11	2.94	0.93	Used
7	I am competent in using AI tools to design personalized programming tasks	24	26	22	16	2.70	1.00	Used
8	I am competent in using AI tools to simplify programming concepts for students	31	29	18	10	2.98	0.90	Used
9	I am competent in using AI tools to assess programming assignments	30	29	19	10	2.95	0.91	Used
10	I am competent in using Perplexity AI for instructional support in programming	16	20	24	28	2.35	1.05	Not Used
Grand Mean						2.89	0.98	Used

Decision benchmark 2.50

The result in Table 1 above showed that ICT teachers recorded a grand mean of 2.89 (SD = 0.98) with a general decision of Used. This indicates that ICT teachers demonstrate a generally high level of competency in the use of Generative AI tools for instructional purposes. The decision is justified by the fact that the grand mean (2.89) is higher than the benchmark mean of 2.50, which implies that, on average, respondents exhibit adequate competency in integrating Generative AI tools into instruction. The standard deviation of 0.98 further revealed a moderate variation in responses among ICT teachers, indicating some differences in the level of competency across the population studied.

This also revealed that while ICT teachers demonstrate overall competency in Generative AI tools, their familiarity and proficiency with more specialized coding assistants and research-oriented AI platforms remain limited. Consequently, the findings reveal a generally high but uneven distribution of competency in the use of Generative AI tools among ICT teachers.

3.2. Results of Research Question two

What is the extent of pedagogical integration of Generative AI tools among ICT teachers in Zaria, Nigeria?

This research question was analyzed using Means and Standard deviation to describe the results, as shown in Table

2

below

Table 2: Pedagogical Integration of Generative AI Tools

S/N	Item	SA	A	D	SD	Mean	STD	Decision
1	I integrate ChatGPT into lesson delivery for programming concepts	28	27	20	10	2.82	0.98	Used
2	I integrate GitHub Copilot during coding demonstrations in class	18	22	25	18	2.45	1.08	Not Used
3	I integrate Google Gemini to explain programming topics to students	30	28	18	9	2.90	0.94	Used
4	I integrate Microsoft Copilot in teaching coding and software development	26	29	20	10	2.84	0.96	Used
5	I integrate Replit Ghostwriter in programming practice sessions	17	20	22	25	2.30	1.10	Not Used
6	I use AI chatbots during classroom interaction for programming support	29	28	19	8	2.88	0.95	Used
7	I integrate AI tools for assigning personalized programming tasks	24	26	22	12	2.70	1.00	Used
8	I use AI tools to simplify programming lessons during instruction	30	28	19	10	2.86	0.95	Used
9	I integrate AI tools for assessing students' programming assignments	27	28	20	12	2.81	0.97	Used
10	I integrate Perplexity AI for instructional support and lesson preparation	18	20	23	24	2.35	1.07	Not Used
Grand Mean						2.69	0.98	Used

Decision benchmark 2.50

The result in Table 2 showed that ICT teachers demonstrate a moderate level of pedagogical integration of Generative AI tools, with a grand mean score of 2.69 (SD = 0.98). When compared with the benchmark mean of 2.50, the result indicates that ICT teachers generally utilize Generative AI tools in their instructional practices, particularly for teaching programming concepts. The decision of Used is justified because the grand mean (2.69) is higher than the criterion mean of 2.50, indicated a positive level of agreement among respondents regarding the integration of Generative AI tools. This revealed that ICT teachers are increasingly incorporating tools such as ChatGPT, Google Gemini, Microsoft Copilot and AI chatbots into lesson

delivery, coding demonstrations and instructional support activities. Generally, the study indicated that ICT teachers demonstrate a functional but developing level of pedagogical integration of Generative AI tools.

3.3. Test of Research Hypothesis

H01. *There is no significant relationship between ICT teachers' technological competency and their pedagogical integration of Generative AI tools in Zaria, Nigeria.*

The Pearson Product-Moment Correlation (PPMC) test was conducted against a criterion mean of 2.50, which represents the midpoint of the 4-point scale and serves as the benchmark for meaningful use.

Table 3: PPMC Analysis of the Relationship Between ICT Teachers' Competency and Pedagogical Integration of Generative AI

Variable	N	Mean	SD	r-cal	p-value	Decision
Relationship Between Technological Competency	105	2.89	0.98	0.76	0.000	Significant
Pedagogical Integration of (GAI) Tools	105	2.69	0.98			
p-value < 0.05		Reject				

The result presented in Table 3 above showed that there is a strong positive relationship between ICT teachers' technological competency and their pedagogical integration of Generative AI tools in Zaria, Nigeria, with a correlation coefficient of $r = 0.76$ and a p-value of 0.000. This indicated that ICT teachers who possess higher technological competency are more likely to integrate Generative AI tools

into their instructional practices. Since the p-value (0.000) is less than the significance level of 0.05, the null hypothesis is rejected. Therefore, there is a statistically significant relationship between ICT teachers' technological competency and their pedagogical integration of Generative AI tools in Zaria, Nigeria.

4. Discussion

ICT Teachers' Technological Competency in the Use of Generative AI Tools: The analysis of Table 1 revealed that ICT teachers in Zaria, Nigeria, demonstrated a generally high level of technological competency in the use of Generative AI tools, with a grand mean score of 2.89 (SD = 0.98), which exceeded the benchmark mean of 2.50. This indicates that respondents possess substantial competency in applying Generative AI tools such as ChatGPT, Google Gemini, Microsoft Copilot and AI chatbots for instructional purposes, particularly in programming education. Although competency levels were relatively high for widely accessible AI tools, lower mean scores recorded for specialized platforms such as GitHub Copilot, Replit Ghostwriter and Perplexity AI summited uneven proficiency across advanced AI applications. This finding revealed that while ICT

teachers are increasingly familiar with mainstream Generative AI technologies, their mastery of specialized AI-driven instructional tools remains comparatively limited.

This finding aligns with UNESCO (2024), which emphasized that teachers' competency in AI integration is strongly influenced by access to practical digital literacy, professional development opportunities and exposure to emerging technologies. Similarly, Zhai (2024) reported that educators globally tend to demonstrate stronger competency in commonly available AI tools than in advanced, specialized AI systems requiring technical depth. The observed competency level may be attributed to increased awareness of AI technologies, self-directed learning and expanding digital engagement among Nigerian ICT teachers.

However, this finding contrasts with Mhlanga (2024), who noted that in many African educational settings, inadequate infrastructure and limited training often constrain teachers' AI competency. Therefore, the present study suggests that ICT teachers in Zaria are gradually developing substantial technological competency in Generative AI usage, although gaps remain in advanced AI tool application.

Pedagogical Integration of Generative AI Tools among ICT Teachers: The findings from Table 2 showed that ICT teachers in Zaria demonstrated a moderate level of pedagogical integration of Generative AI tools, with a grand mean score of 2.69 (SD = 0.98), which was above the criterion mean of 2.50. This indicates that ICT teachers generally integrate Generative AI tools into instructional practices such as lesson delivery, programming explanation, classroom interaction and assessment activities. However, the integration was not uniform across all AI platforms, with greater use observed for tools such as ChatGPT, Google Gemini and Microsoft Copilot, while advanced systems such as GitHub Copilot, Replit Ghostwriter and Perplexity AI remained underutilized.

This finding is consistent with Denny et al. (2024), who observed that teachers are more likely to pedagogically integrate accessible and user-friendly AI tools into classroom instruction than technically sophisticated platforms requiring advanced competency. Similarly, Okonkwo and Ade-Ibijola (2024) found that Nigerian educators increasingly incorporate AI tools for lesson planning and instructional support but often face barriers in advanced pedagogical integration due to inadequate training and infrastructural limitations.

In contrast, Miao and Cukurova (2024) reported that in educational systems with structured AI competency frameworks, teachers exhibit deeper and more consistent pedagogical integration of AI technologies. Therefore, the moderate level of integration identified in this study submitted that while ICT teachers in Zaria are embracing Generative AI in instructional practice, full-scale pedagogical transformation remains constrained by competency gaps, resource limitations and uneven exposure to advanced AI tools.

Relationship Between ICT Teachers' Competency and Pedagogical Integration of Generative AI Tools: The analysis of Hypothesis One using Pearson Product-Moment Correlation revealed a statistically significant positive relationship between ICT teachers' technological

competency and their pedagogical integration of Generative AI tools ($r = 0.76$, $p < 0.05$). Consequently, the null hypothesis was rejected. This result indicates that higher levels of technological competency among ICT teachers are strongly associated with greater pedagogical integration of Generative AI tools in instructional practice. In essence, teachers who possess stronger technical skills and familiarity with AI tools are more likely to effectively incorporate these technologies into teaching activities.

This finding is supported by the UNESCO AI Competency Framework for Teachers (Miao & Cukurova, 2024), which emphasizes competency as a foundational driver of effective pedagogical AI integration. Similarly, Trust et al. (2018) found that teachers' digital competency significantly predicts successful adoption and instructional use of emerging educational technologies. The result also aligns with Adeleke et al. (2025), who reported that Nigerian teachers' practical competency directly influences their classroom application of AI tools.

Conversely, studies such as Bervell and Umar (2021) suggest that competency alone may be insufficient where institutional barriers remain severe. Nevertheless, the strong positive relationship observed in this study underscores that technological competency is a critical determinant of pedagogical integration. Generally, the findings revealed that strengthening ICT teachers' AI-related competencies through professional development, policy support and infrastructure enhancement is essential for achieving sustainable and effective integration of Generative AI tools in secondary education in Zaria, Nigeria.

5. Conclusion

The study concluded that ICT teachers in these secondary schools in Zaria, Nigeria, possess high technological competency in the use of Generative AI tools, but their pedagogical integration remains moderate and uneven across different AI platforms. A significant positive relationship exists between teachers' competency and their pedagogical integration of Generative AI tools, implying that increased competency enhances effective instructional use. Therefore, improving teachers' technological skills through continuous training and institutional support is essential for maximizing the educational benefits of Generative AI in secondary schools.

Recommendations

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

1. Educational policymakers and curriculum development agencies, such as the Federal Ministry of Education and Kaduna State Ministry of Education, should develop and implement structured policies that promote the integration of Generative AI tools into ICT education. This should include incorporating AI literacy, ethical AI usage and practical AI applications into teacher training programmes and secondary school ICT curricula.
2. School administrators and educational institutions should organize continuous professional development programmes, workshops and hands-on training for ICT

teachers to strengthen their technological competency in both general and advanced Generative AI tools such as GitHub Copilot, Replit Ghostwriter and Perplexity AI. This will enhance teachers' practical proficiency and improve effective pedagogical integration.

3. ICT teachers and professional teaching associations should actively engage in self-directed learning, peer collaboration and professional learning networks to continuously improve their competency in emerging Generative AI technologies. This will ensure sustained instructional innovation, broader pedagogical application and improved teaching effectiveness in programming and other ICT-related subjects.

Abbreviations

GenAI	Generative Artificial Intelligence
PPMC	Pearson Product Moment Correlation
ICT	Information and Communication
NERDC	Technology Nigerian Educational Research and
NITDA	Development Council National Information Technology
UBEC	Development Agency
KDBSASC	Universal Basic Education Commission Kaduna State Bureau of Statistics Annual
ITCPIGAITQ	School Census ICT Teachers' Competency and
	Pedagogical Integration of Generative AI
	Tools Questionnaire
UNESCO	United Nations Educational, Scientific and
	Cultural Organization
WAEC	West African Examinations Council
NECO	National Examinations Council

Author Contributions

Bayo Ezekiel Awolusi: Conceptualization, Investigation, Validation, writing –Review & Editing, Project Administration, Methodology,

Latifat Abduraheem-Olaniyi: Data Curation, Investigation,
Salamat Muhammad: Formal Analysis, Writing - original draft.

Conflicts of Interest

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