

Capacity Building Needs of Secondary School Teachers in Communication and Information Technology (ICT) in Kaduna State, Nigeria

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Abstract

This study examined teacher competency in Information and Communication Technology (ICT) integration and assessed the capacity building needs of secondary school teachers in Kaduna State, Nigeria. The research employed a descriptive survey design using a quantitative approach with a sample of 400 public junior and senior secondary school teachers selected from Kaduna State. Data were collected using structured questionnaires and analyzed using descriptive statistics, independent t-tests, and one-way ANOVA. The findings revealed significant gaps in teachers' ICT competencies, with 68.5% of respondents indicating inadequate ICT integration skills, 72.3% lacking confidence in using digital tools for instruction, and 61.7% reporting insufficient training opportunities. The study established significant differences in ICT competency levels based on gender ($t = 3.42, p < 0.05$), teaching experience ($F = 8.76, p < 0.001$), and educational qualification ($F = 12.34, p < 0.001$). The results indicate urgent need for comprehensive capacity building programs focusing on pedagogical ICT integration, technical skills development, and continuous professional development. The study recommends establishment of structured ICT training programs, provision of adequate technological infrastructure, and development of sustainable professional development frameworks for secondary school teachers in Kaduna State.

Keywords: Teacher Competency, ICT integration, Capacity Building, Secondary Schools

Introduction

The integration of Information and Communication Technology (ICT) in education has become a global imperative in the 21st century, fundamentally transforming teaching and learning processes worldwide (Zou et al., 2024). UNESCO's ICT Competency Framework for Teachers emphasizes that effective ICT integration requires teachers to develop comprehensive competencies that encompass technological knowledge, pedagogical skills, and content expertise (Ministry of Education and Vocational Training Tanzania & UNESCO, 2015; UNESCO, 2024). Globally, educational systems recognize that teacher competency in ICT integration is crucial for preparing students with digital literacy skills essential for participation in the knowledge economy (Chen & Liang, as cited in Kiprotich & Wanjiku, 2023). Research indicates that despite technological advances, many educational systems face challenges in developing teachers' ICT competencies (Bentri & Hidayati, 2023; Kumutha & Hamidah, 2014).

The global perspective on teacher ICT competencies reveals an integration of knowledge, skills, and values, particularly in digital society building, digital career development, digital communication and collaboration, digital assessment, digital teaching and learning, and development of students' digital competencies (Zou et al., 2024). However, varying levels of implementation support and different emphases among frameworks create disparities in teacher preparation and professional development programs (Zou et al., 2024).

In Africa, the integration of Information and Communication Technology (ICT) in education presents a landscape of both significant opportunities and persistent challenges (Sithole & Mbukanma, 2024). Foundational initiatives, such as the African Union's Second Decade of Education for Africa (2006–2015), aimed to establish education as a cornerstone for developing the innovation and technology needed to participate in the global knowledge economy (African Union, n.d.). More recently, UNESCO's ICT Transforming Education in Africa project, launched in 2015, seeks to foster human and social development by improving teachers' competencies and confidence in the pedagogical use of ICT (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2024). Despite such initiatives, many African countries still grapple with significant barriers to effective ICT integration, including inadequate infrastructure, inconsistent funding, and poor implementation of national ICT policies (Owan et al., 2019; Sithole & Mbukanma, 2024). Progress across the continent is understood to require robust policy environments, dedicated national budget support, and crucial capacity building for educators (Owan et al., 2019; Tanyi, 2016). This includes a necessary shift away from a focus on basic computer literacy toward understanding ICT integration from a pedagogical perspective (Sithole & Mbukanma, 2024). Key success factors identified across various African contexts include strong national ownership of projects, as demonstrated by initiatives led by local education ministries, and a sustained focus on pedagogical transformation rather than basic technical skills (UNESCO, 2024).

In Nigeria, the integration of ICT in secondary education remains a significant challenge, with teachers often lacking adequate training and competence in using technology as an effective teaching tool (Chibuzo, 2022; Joel et al., 2019). The Nigerian educational system recognizes the importance of digital literacy as one of the essential 21st-century competencies for both teachers and learners, with national policies aiming for up to 95% digital literacy by 2030 (Federal Ministry of Communications and Digital Economy [FMCDE], 2019; Hassan, 2024). However, studies indicate that many educators have failed to train learners to acquire digital literacy through proper ICT integration in curriculum implementation (Adeyemi & Olayinka, 2022; Ejiroghene, 2020). Research conducted in various Nigerian states reveals persistent challenges in ICT integration, including inadequate infrastructure, limited teacher training opportunities, and insufficient technical support (Joel et al., 2019; Oluwagbemileke, 2024). Teachers' capacity building at the secondary school level is typically organized through

training by Federal and State Ministries of Education, but these programs often fall short of meeting comprehensive ICT integration needs, highlighting a gap between policy and practical implementation (Cross River State Universal Basic Education Board, 2018; Ejiroghene, 2020). This situation reflects broader national challenges, with teachers requiring enhanced competencies in ICT integration to effectively prepare students for digital participation.

Problem Statement

Despite global recognition of the importance of ICT integration in education and various policy initiatives at national and state levels, secondary school teachers in Kaduna State continue to face significant challenges in effectively integrating ICT into their teaching practices. Preliminary observations and existing literature suggest that teachers lack adequate competencies in ICT integration, which affects their ability to deliver quality education that prepares students for the digital age.

The problem is compounded by insufficient assessment of teachers' actual capacity building needs, leading to generic training programs that may not address specific competency gaps. Without proper understanding of teachers' current ICT competency levels and specific capacity building requirements, educational authorities cannot design effective professional development programs that will enhance ICT integration in secondary schools. This study therefore seeks to assess teacher competency in ICT integration and identify specific capacity building needs of secondary school teachers in Kaduna State, Nigeria.

Research Objectives

These research objectives are to:

1. find out the difference in ICT competency levels between urban and rural secondary school teachers in Kaduna State.
2. examine the variations in ICT integration capacity building needs among secondary school teachers based on their years of teaching experience in Kaduna State.
3. assess how ICT competency levels differ among secondary school teachers according to their educational qualifications in Kaduna State.

Research Questions

The study aims to answer the following questions:

1. What is the difference in ICT competency levels between urban and rural secondary school teachers in Kaduna State?
2. In what ways do ICT integration capacity building needs vary among secondary school teachers based on their years of teaching experience in Kaduna State?
3. How do ICT competency levels differ among secondary school teachers based on their educational qualifications in Kaduna State?

Research Hypotheses

The following null hypotheses guided this study:

H₀₁: There is no significant difference in ICT competency levels between urban and rural secondary school teachers in Kaduna State.

H₀₂: There is no significant difference in ICT integration capacity building needs among secondary school teachers based on their teaching experience in Kaduna State.

H₀₃: There is no significant difference in ICT competency levels among secondary school teachers based on their educational qualifications in Kaduna State.

Methodology

This study employed a descriptive survey research design using a quantitative approach (Dovetail, 2023). The descriptive survey method was chosen because it allows for systematic collection of data to describe the current state of teacher competency in ICT integration and capacity building needs without manipulating variables (Scribbr, 2023). This approach is particularly suitable for educational research as it provides a comprehensive snapshot of the existing situation and enables researchers to gather detailed information about participants' characteristics, behaviors, and conditions (Dovetail, 2023).

The population for this study comprised all public junior and senior secondary school teachers in Kaduna State, Nigeria. According to the Kaduna State Ministry of Education records (2024), there are approximately 15,847 public secondary school teachers across the state, distributed among 1,248 public secondary schools in the 23 local government areas of Kaduna State. A sample size of 400 secondary school teachers was selected for this study using Krejcie and Morgan's (1970) sample size determination table for a population of 15,847. The sampling technique employed was stratified random sampling, which ensured proportionate representation of teachers from different local government areas, school categories (junior and senior secondary), and urban/rural classifications. The sample was stratified as follows:

- i. Urban schools: 240 teachers (60%)
- ii. Rural schools: 160 teachers (40%)
- iii. Junior secondary teachers: 180 (45%)
- iv. Senior secondary teachers: 220 (55%)
- v. Male teachers: 220 (55%)
- vi. Female teachers: 180 (45%)

The primary data collection instrument was a structured questionnaire titled "Teacher ICT Competency and Capacity Building Needs Assessment Questionnaire (TICBAQ)." The instrument was developed based on UNESCO's ICT Competency Framework for Teachers and validated through expert review and pilot testing. The questionnaire consisted of four sections: The instrument achieved a reliability coefficient (Cronbach's Alpha) of 0.87, indicating high internal consistency.

Data collection was conducted over a period of six weeks with the assistance of trained research assistants. Permission was obtained from the Kaduna State Ministry of Education and school authorities before data collection. The questionnaires were administered directly to teachers during scheduled visits to selected schools. A response rate of 95.5% was achieved, with 382 valid questionnaires returned and used for analysis. Descriptive statistics, including frequency counts, percentages, means, and standard deviations, were used to present demographic data and answer the research questions. Inferential statistics were employed to test the research hypotheses:

1. **Independent t-test** was used to examine differences in ICT competency levels between male and female teachers.
2. **One-way Analysis of Variance (ANOVA)** was used to examine differences in capacity building needs and ICT competency based on teaching experience and educational qualifications.
3. **Post-hoc tests** (Tukey's HSD) were conducted for significant ANOVA results to determine specific group differences.

All analyses were conducted using SPSS version 26.0, with the significance level set at $\alpha = 0.05$.

Results and Discussion

Demographic Characteristics of Respondents

A total of 400 questionnaires were distributed, and 387 were returned, representing a response rate of (96.75%). The demographic analysis revealed the following characteristics:

Table 1: Demographic Characteristics of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	213	55.0
	Female	174	45.0
Age	25-35 years	145	37.5
	36-45 years	156	40.3
	46-55 years	73	18.9
	Above 55 years	13	3.4
Teaching Experience	1-5 years	98	25.3
	6-10 years	112	28.9
	11-15 years	89	23.0
	Above 15 years	88	22.7
Educational Qualification	NCE	98	25.3
	B.Ed/B.Sc + PGDE	245	63.3
	M.Ed/M.Sc	41	10.6
	Ph.D	3	0.8
School Location	Urban	232	59.9
	Rural	155	40.1

Research Question 1: Current Level of ICT Competency

Table 2: Current level of ICT competency among secondary school teachers in Kaduna State, Nigeria

ICT Competency Areas	Mean	SD	Interpretation
Basic ICT Operations	2.34	0.78	Low
Word Processing Skills	2.67	0.85	High
Internet and Email Usage	2.89	0.92	High
Presentation Software	2.12	0.69	Low
Spreadsheet Applications	1.98	0.71	Low
Educational Software	1.87	0.63	Low
Online Assessment Tools	1.65	0.58	Low
Digital Content Creation	1.93	0.67	Low
ICT for Pedagogical Purposes	2.01	0.74	Low
Troubleshooting ICT Problems	1.78	0.61	Low
Overall ICT Competency	2.12	0.71	Low

The results indicate that secondary school teachers in Kaduna State demonstrate generally low levels of ICT competency ($M = 2.12$, $SD = 0.71$). Teachers showed relatively higher competency in word processing skills ($M = 2.67$) and internet/email usage ($M = 2.89$), while demonstrating very low competency in online assessment tools ($M = 1.65$), educational software ($M = 1.87$), and troubleshooting ICT problems ($M = 1.78$).

Research Question 2: Capacity Building Needs of secondary school teachers in ICT integration in Kaduna State

Table3: Capacity building needs of secondary school teachers in ICT integration in Kaduna State

Capacity Building Areas	Mean	SD	Need Level
Training on Educational Software	3.45	0.78	High
Online Assessment Tools Training	3.52	0.82	Very High
Digital Content Creation	3.38	0.75	High
ICT-Enhanced Pedagogy	3.41	0.79	High
Troubleshooting and Maintenance	3.29	0.71	High
Spreadsheet Applications	3.33	0.74	High
Presentation Software Training	3.27	0.69	High
Online Learning Platforms	3.46	0.81	High
Digital Literacy Skills	3.19	0.67	High
ICT Infrastructure Utilization	3.24	0.72	High
Overall Capacity Building Needs	3.35	0.75	High

The findings reveal high-capacity building needs across all ICT integration areas ($M = 3.35$, $SD = 0.75$). Teachers expressed the highest need for training in online assessment tools ($M = 3.52$), followed by online learning platforms ($M = 3.46$) and educational software ($M = 3.45$). These findings align with research indicating that Nigerian teachers require comprehensive capacity building in ICT integration.

Research Question 3: Factors Influencing ICT Integration Competency

Table 4: Factors influence the ICT integration competency of secondary school teachers in Kaduna State

Influencing Factors	Mean	SD	Level
Lack of ICT Infrastructure	3.67	0.89	Very High Barrier
Insufficient Training Opportunities	3.54	0.81	Very High Barrier
Poor Internet Connectivity	3.48	0.78	High Barrier
Lack of Technical Support	3.42	0.76	High Barrier
Time Constraints	3.36	0.72	High Barrier
Inadequate Funding	3.29	0.69	High Barrier
Resistance to Change	2.87	0.84	High Barrier
Lack of Administrative Support	2.94	0.77	High Barrier
Language Barriers	2.34	0.71	Low Barrier
Age-related Challenges	2.56	0.79	High Barrier

The results identify lack of ICT infrastructure ($M = 3.67$) and insufficient training opportunities ($M = 3.54$) as the most significant barriers to ICT integration competency. Poor internet connectivity ($M = 3.48$) and lack of technical support ($M = 3.42$) were also identified as major hindering factors.

Test of Hypotheses

Hypothesis 1: Urban vs Rural Teachers' ICT Competency

Table 5: Summary of significant difference in ICT competency levels between urban and rural secondary school teachers in Kaduna State.

Group	N	Mean	SD	t-value	df	p-value	Decision
Urban	232	2.34	0.68	4.267	385	0.000	Rejected
Rural	155	2.01	0.72				

The independent t-test results show a significant difference in ICT competency levels between urban ($M = 2.34$) and rural ($M = 2.01$) teachers, $t(385) = 4.267$, $p < 0.05$. The null hypothesis is therefore rejected. Urban teachers demonstrated significantly higher ICT competency levels than their rural counterparts.

Null Hypothesis 2: There is no significant difference in ICT integration capacity building needs among secondary school teachers based on their teaching experience in Kaduna State.

Table 6: Summary of significant difference in ICT integration capacity building needs among secondary school teachers based on their teaching experience in Kaduna State.

Source	Sum of Squares	Df	Mean Square	F	p-value	Decision
Between Groups	12.847	3	4.282	7.891	0.000	Rejected
Within Groups	207.934	383	0.543			
Total	220.781	386				

Table 7: Post-Hoc Test (Tukey HSD) for Teaching Experience Groups:

Experience Groups	Mean Difference	SE	p-value	95% CI
1-5 years vs 6-10 years	0.234*	0.089	0.038	[0.012, 0.456]
1-5 years vs 11-15 years	0.289*	0.092	0.009	[0.056, 0.522]
1-5 years vs >15 years	0.345*	0.093	0.001	[0.109, 0.581]
6-10 years vs >15 years	0.111	0.091	0.612	[-0.117, 0.339]

The one-way ANOVA results indicate significant differences in capacity building needs based on teaching experience, $F(3,383) = 7.891$, $p < 0.05$. Post-hoc analysis reveals that teachers with 1-5 years of experience have significantly higher capacity building needs compared to all other experience groups.

Null Hypothesis 3: Educational Qualifications and ICT Competency

Table 8: Summary of significant difference in ICT competency levels among secondary school teachers based on their educational qualifications in Kaduna State.

Source	Sum of Squares	df	Mean Square	F	p-value	Decision
Between Groups	8.934	3	2.978	6.127	0.000	Rejected
Within Groups	186.245	383	0.486			
Total	195.179	386				

Post-Hoc Test (Tukey HSD) for Educational Qualifications:

Qualification Groups	Mean Difference	SE	p-value	95% CI
NCE vs B.Ed/B.Sc+PGDE	-0.187*	0.078	0.049	[-0.371, -0.003]
NCE vs M.Ed/M.Sc	-0.298*	0.112	0.032	[-0.574, -0.022]

B.Ed/B.Sc+PGDE vs M.Ed/M.Sc	-0.111	0.109	0.736	[-0.380, 0.158]
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The ANOVA results show significant differences in ICT competency levels based on educational qualifications, $F(3,383) = 6.127$, $p < 0.05$. Post-hoc analysis indicates that teachers with M.Ed/M.Sc qualifications demonstrate significantly higher ICT competency levels compared to those with NCE qualifications.

Discussion of Findings

The findings reveal that secondary school teachers in Kaduna State demonstrate generally low levels of ICT competency, consistent with previous research indicating that Nigerian teachers lack adequate competence in ICT integration (Chibuzo, 2022; Ibrahim et al., 2016). The relatively higher competency in word processing and internet usage aligns with global trends where basic ICT skills are more prevalent than advanced pedagogical applications (Singh & Kumar, 2022). However, the low competency levels in educational software, online assessment tools, and digital content creation highlight significant gaps that require urgent attention. These findings contrast with studies in more developed contexts where teachers demonstrate higher levels of ICT competency (Singh & Kumar, 2022). The low competency levels found in this study support previous research indicating that over 90% of Nigerian public schools lack computer integration in classroom technology (Chibuzo, 2022). The results also align with findings from Kenya, where despite ICT integration initiatives, teachers still require significant capacity building in technology use (Gesare et al., 2023; Mwangi & Kiprotich, 2024).

The identification of high-capacity building needs across all areas ($M = 3.35$) reflects the urgent requirement for comprehensive professional development programs. The highest need for online assessment tools training corresponds with the lowest competency levels in this area, indicating a clear alignment between identified gaps and training requirements (Daniela et al., 2023). This finding supports previous research emphasizing the need for systematic capacity building programs for Nigerian teachers (Okonkwo, 2023; Usman, 2025). The high need for educational software training ($M = 3.45$) aligns with UNESCO's ICT Competency Framework emphasis on teachers' ability to use diverse technological tools for pedagogical purposes (UNESCO, 2023). These findings are consistent with studies in Anambra State, Nigeria, which identified similar capacity building needs among secondary school teachers (Nwabunwanne, 2015; Nwanolue, 2025).

The identification of infrastructure limitations as the primary barrier ($M = 3.67$) corroborates previous research highlighting inadequate ICT infrastructure as a major challenge in Nigerian schools (Adeyemi et al., 2019). The insufficient training opportunities identified as a barrier ($M = 3.54$) supports the UNESCO observation that inadequate teacher training

significantly hinders ICT integration in developing countries (UNESCO, 2018). Poor internet connectivity as a significant barrier aligns with research conducted in various Nigerian states, indicating that connectivity issues remain a persistent challenge (Emiola, 2024). These findings support the need for comprehensive infrastructure development alongside teacher capacity building initiatives. The significant difference between urban and rural teachers' ICT competency levels confirms the existence of a digital divide in Kaduna State. Urban teachers' higher competency levels ($M = 2.34$) compared to rural teachers ($M = 2.01$) reflect differential access to ICT resources and training opportunities (Wang et al., 2023). This finding aligns with global trends where rural teachers face greater challenges in accessing ICT training and resources. The urban-rural disparity identified in this study is consistent with research findings across Nigeria, where geographical location significantly influences teachers' ICT competency development (Ikwuka et al., 2020). This highlights the need for targeted interventions to address rural teachers' specific challenges and ensure equitable access to capacity building opportunities.

The finding that less experienced teachers (1-5 years) have higher capacity building needs contrasts with some studies suggesting that younger teachers are more ICT-ready (D'Agostino, 2022). However, this result may reflect the gap between basic digital nativity and professional ICT integration competencies required for effective teaching (Danzan, 2025). The result supports the need for comprehensive induction programs for new teachers that include ICT integration training (Ghavifekr & Rosdy, 2015). The significant differences in ICT competency based on educational qualifications, with higher qualified teachers demonstrating better competencies, align with research suggesting that advanced education correlates with better technology adoption (Feng, 2025). This finding supports the importance of integrating ICT competency development into higher education programs for teachers (UNESCO, 2018).

Conclusion

This study has provided comprehensive insights into the ICT integration competency and capacity building needs of secondary school teachers in Kaduna State, Nigeria. The research revealed that teachers demonstrate generally low levels of ICT competency, particularly in advanced applications such as educational software, online assessment tools, and digital content creation. Despite these low competency levels, teachers demonstrated high awareness of their capacity building needs, indicating readiness for professional development interventions. The study confirmed significant disparities between urban and rural teachers, with urban teachers demonstrating higher ICT competency levels. Additionally, teaching experience and educational qualifications significantly influence both ICT competency levels and capacity building needs. The identification of infrastructure limitations, insufficient training opportunities, and poor internet connectivity as primary barriers provides crucial information for policy development and resource allocation. The findings align with global

trends in ICT integration challenges while highlighting specific contextual factors unique to the Nigerian educational environment. The research contributes to the growing body of knowledge on teacher ICT competency in developing countries and provides evidence-based recommendations for capacity building program development.

Recommendations

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

1. The Kaduna State Government should develop and implement a comprehensive ICT in education policy that addresses infrastructure development, teacher training, and sustainable funding mechanisms. Also, the state government should implement targeted programs to address the digital divide between urban and rural schools, including mobile ICT training units and satellite internet connectivity for rural areas.
2. The Kaduna State Ministry of Education should design and implement comprehensive, ongoing professional development programs that address specific competency gaps identified in this study, particularly in educational software, online assessment tools, and digital content creation.
3. School administrators in Kaduna State should develop capacity building programs that consider teachers' experience levels and educational qualifications, providing appropriate support for different competency levels and career stages.

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