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Assessing the Impact of ICT Integration on Learning Outcomes in Nigerian Tertiary Institutions

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Abstract

This study examines the impact of Information and Communication Technology (ICT) integration on learning outcomes in Nigerian tertiary institutions. Using a cross-sectional survey design, data were collected from 300 students and 50 lecturers across three public institutions in Delta State, Nigeria. The study examined the relationship between ICT usage frequency, digital infrastructure availability, and academic performance. Results showed a positive correlation between ICT accessibility and student performance, but barriers such as unstable power supply, insufficient ICT training, and limited institutional support remain significant. Recommendations include policy-driven infrastructure investment and regular training for both staff and students.

Keywords: ICT Integration, Learning Outcomes, Nigerian Tertiary Institutions, Digital Infrastructure, Educational Technology

Introduction

The rapid evolution of Information and Communication Technology (ICT) has transformed the global education landscape, particularly in developing countries striving to enhance access and quality in tertiary education. In sub-Saharan Africa, and particularly Nigeria, the push toward digital education gained momentum during the COVID-19 pandemic, which forced institutions to

adopt virtual learning platforms (Nhleko et al, 2024; UNESCO, 2023). ICT is increasingly recognized as a powerful enabler of knowledge dissemination, interactive learning, and academic innovation. In the Nigerian context, where educational institutions are often challenged by infrastructural deficits, ICT offers opportunities to bridge gaps in content delivery, teacher capacity, and student engagement ((Zeleza & Okanda, 2021).

Despite notable policy-level efforts to promote ICT adoption in higher education, actual implementation remains inconsistent across Nigerian tertiary institutions. Many schools operate with outdated computer labs, limited internet access, and poorly maintained infrastructure. Additionally, disparities between private and public institutions in ICT resource allocation have further widened the digital divide among students and faculty (Otu et al., 2021).

This study seeks to assess the level of ICT integration in Nigerian tertiary institutions, focusing on three key areas: the availability of ICT tools and infrastructure, the frequency and type of ICT usage among students and academic staff, and the challenges that hinder full utilization of ICT in the classroom. Using survey data collected, the study aims to identify patterns of adoption and evaluate the relationship between ICT use and perceived academic performance.

Problem Statement

Despite increased awareness of ICT's educational benefits, Nigerian tertiary institutions struggle to fully integrate these tools into classroom learning. This study seeks to assess the realities of ICT implementation and its influence on academic performance.

Objectives of the Study

- Assess the availability and use of ICT resources in Nigerian tertiary institutions.
- Examine the relationship between ICT integration and student academic performance.
- Identify the major challenges to ICT implementation in higher education settings.

Research Questions

1. What ICT tools are most commonly used in tertiary institutions?
2. How does the frequency of ICT use correlate with student academic performance?
3. What are the key challenges institutions face in implementing ICT?

Hypotheses

H_0: There is no significant difference between students' and lecturers' perceptions of the impact of ICT usage on academic performance.

Literature Review

Globally, digital learning is transforming education delivery. According to *UNESCO (2023)*, digital learning has the potential to democratize access to quality education and promote inclusive learning. In developed nations, ICT integration has matured into blended learning ecosystems, while in developing countries, progress is uneven due to infrastructural limitations (OECD, 2021). In Africa, ICT adoption is often donor-driven, with slow institutionalization due to technical and financial barriers (Nhleko et al, 2024). The role of ICT in transforming higher education has been well documented globally. In sub-Saharan Africa, the adoption of ICT in education is on the rise but remains largely donor-driven and under-resourced. Nhleko et al, (2024) noted that despite improvements in ICT policy frameworks, implementation at the institutional level lags due to inconsistent funding and insufficient technical expertise.

Recent studies have underscored the positive relationship between ICT usage and academic performance, indicating that students exposed to digital learning environments often demonstrate improved comprehension, engagement, and retention (Yasin et al., 2023; Widowati et al., 2023). Effiom et al. (2023) found a positive correlation between ICT use and student performance in science and engineering faculties in federal universities. Similarly, Oladokun et al. (2024) demonstrated that students who frequently accessed e-learning platforms performed better academically than those who relied solely on face-to-face instruction. However, despite these promising outcomes, the effective integration of ICT in Nigerian tertiary institutions faces several challenges (Memon & Memon, 2025).

Common barriers to ICT implementation in Nigerian tertiary institutions include, Inadequate infrastructure (Ntorukiri et al. 2022; Anike, 2024), Unreliable electricity supply (Oyefara et al., 2021), Low digital literacy among staff and students (Chigbundu & Oluwabiyi, 2023; Souheyla, 2019), Institutional resistance to change (Tariq& Mehmood, 2024) and inconsistent policy implementation (Bećirović, 2023). In many tertiary institutions, only a fraction of students have regular access to internet-enabled devices or institutional Wi-Fi. These barriers are compounded by inconsistent government support and lack of strategic ICT policies tailored to educational institutions.

Moreover, the perceptions of students and academic staff toward ICT innovations play a critical role in their adoption and impact. For instance, Abubakar et al. (2024) highlighted how student attitudes toward AI-powered learning platforms affect their engagement and academic performance, while Binitie and Okoh (2025) emphasized the importance of administrative support and strategic implementation for the success of e-learning initiatives in Nigeria. As such, evaluating the impact of ICT integration must not only consider technological access but also pedagogical effectiveness, institutional readiness, and user adaptability.

This paper, therefore, seeks to assess the impact of ICT integration on learning outcomes in Nigerian tertiary institutions. It aims to bridge the gap between technological provision and actual educational performance by exploring both the enabling factors and the systemic challenges shaping ICT-driven education in the Nigerian context. Through this investigation, the study contributes to the broader discourse on educational innovation and policy, offering insights for stakeholders on how to optimize ICT usage for academic excellence in higher education.

Methodology

This study adopted a descriptive survey research design to assess the impact of ICT integration on student learning outcomes in Nigerian tertiary institutions. The design was chosen to allow for the collection of standardized data from a wide population, enabling both quantitative and qualitative analyses. The population consisted of students and lecturers from three public tertiary institutions in Delta State, Nigeria:

- Delta State Polytechnic, Ogwashi-Uku
- Federal College of Education (Technical), Asaba
- Delta State University, Abraka

A sample of 300 students and 50 lecturers was selected using a stratified random sampling technique, ensuring representation across faculties, gender, and academic levels. Out of the 300 students selected for the study, 100 were from Delta State Polytechnic, Ogwashi-uku, 50 were from Federal College of Education (Technical), Asaba, and 150 from Delta State University, Abraka. For the lecturers, out of the 50 selected for the study, 15 were from Delta State Polytechnic, Ogwashi-uku, 15 were from Federal College of Education (Technical), Asaba, and 20 from Delta State University, Abraka.

Questionnaire titled "Impact of ICT on Learning Outcome (IICTLO)" was designed to assess available ICT tools, its perceived impact on academic performance, and the challenges facing its utilization. The instruments used 5-Likert-scale items, to elicit responses. Mean of 3.0 and above is considered to be favorable response while mean below 3.0 is considered an unfavorable response. Reliability was established using Cronbach's Alpha = 0.84. Permission was obtained from institutional authorities before distributing the questionnaires both in physical and digital format. Data collection lasted three weeks, with trained assistants facilitating on-campus distribution.

Descriptive statistics (mean, standard deviation) were used to summarize the data. Inferential statistics such as Pearson correlation was used to test the hypotheses at a significance level of $p < 0.05$.

Data Analysis and Result Presentation

This section presents the mean and standard deviation of responses from students and lecturers regarding their usage of various ICT tools in teaching and learning. The data were collected using a Likert scale of 1-5, where lower mean scores indicate infrequent

use of a given tool. Out of the 55 lecturers sampled for the study, 50 valid responses was retrieved. Also, out of the 320 students sampled for the study, 300 valid responses was retrieved.

Table1: Demographic Characteristics of Respondents

Category	Variable	Students (N = 300)	Lecturers (N = 50)
Gender	Male	160 (53.3%)	30 (60.0%)
	Female	140 (46.7%)	20 (40.0%)
Age Group	18–24 years	220 (73.3%)	0 (0.0%)
	25–34 years	70 (23.3%)	5 (10.0%)
	35–44 years	10 (3.3%)	25 (50.0%)
	45 years and above	0 (0.0%)	20 (40.0%)
Academic Level / Position	100 L–400 L	300 (100%)	—
	Assistant Lecturer	—	10 (20.0%)
	Lecturer II / I	—	25 (50.0%)
	Senior Lecturer / Above	—	15 (30.0%)
ICT Training	Yes	110 (36.7%)	35 (70.0%)
	No	190 (63.3%)	15 (30.0%)

The demographics reveal a student population that is young but largely untrained in ICT use, and a lecturer group that is older but better trained. This mismatch may partly explain the low perceived impact of ICT on academic outcomes, emphasizing the need for comprehensive ICT training and inclusive implementation strategies across all age groups and user levels.

Research Question 1: What ICT tools are most commonly used in tertiary institutions?

Table 2: Mean and Standard Deviation of ICT Tools Usage

S/N	ICT Tool	Students Mean (SD)	Lecturers Mean (SD)
1	Interactive Whiteboards and Smart Boards	2.15 (1.08)	2.05 (1.02)
2	Mobile Devices: Tablets and Laptops	3.50 (1.20)	3.40 (1.25)
3	Learning Management Systems (e.g., Moodle, Blackboard)	2.35 (1.10)	2.25 (1.20)
4	Projectors and Audio Systems	2.30 (1.18)	2.10 (1.17)
5	Presentation Software (e.g., PowerPoint, Google Slides)	3.70 (1.30)	3.60 (1.25)
6	Zoom, Google Meet, Microsoft Teams	2.40 (1.18)	2.30 (1.20)
7	Online Academic Resources (e.g., e-Libraries, Google Scholar)	2.45 (1.12)	2.35 (1.08)
8	Google Workspace, Microsoft 365	2.60 (1.28)	2.50 (1.20)
9	ChatGPT, Claude AI	1.85 (0.90)	1.75 (1.00)
10	Gamification and Virtual Reality (VR lab)	1.65 (0.85)	1.55 (0.90)

The results in Table 2 indicate that **the overall use of ICT tools is generally low** among both students and lecturers, with most of the mean values falling below 3.0. This suggests that these tools are **not being frequently integrated** into everyday academic activities (Olelewe & Okwor, 2017).

The **lowest levels of usage** were recorded for **Gamification and Virtual Reality tools (students: 1.65; lecturers: 1.55)** and **AI tools such as ChatGPT and Claude AI (students: 1.85; lecturers: 1.75)**. These findings reflect limited exposure or access to advanced or emerging technologies within the academic environment. In contrast, relatively higher usage was noted for **presentation software (students: 3.70; lecturers: 3.60)** and Mobile Devices: Tablets and Laptops **(students: 3.50; lecturers: 3.40)**. This trend may be attributed to the familiarity, ease of use, and long-standing presence of these tools in academic settings (Munje & Jita, 2020).

The **standard deviation values**, which ranged from 0.85 to 1.30, suggest **moderate variation** in responses. For most tools, the variation indicates a mixture of users who either engage regularly or very rarely, pointing to inconsistencies in adoption. Notably, there is **strong alignment in the responses** between students and lecturers. This parallel trend underscores a broader institutional or systemic limitation rather than differences in user attitudes or competencies (Binitie & Okoh, 2025).

The analysis reveals a **suboptimal adoption** of ICT tools across the board. While basic tools such as presentation software and Mobile Devices: Tablets and Laptops show some level of usage, there is a **significant underutilization** of modern, high-impact tools like virtual reality labs and artificial intelligence applications. These results highlight the need for increased training, resource allocation, and institutional support to drive meaningful ICT integration in education.

To evaluate the educational consequences of ICT underutilization, respondents were asked to rate the **impact of ICT integration** on several learning and teaching outcomes. The dimensions assessed include **digital literacy, critical thinking, academic performance, problem-solving, technical proficiency, collaboration**, and **attitudes toward learning**.

Research Question 2: How does the frequency of ICT use correlate with student educational outcome?

Table 3: Mean and Standard Deviation of Perceived Educational Outcomes of ICT Tools Usage

S/N	Educational Outcome	Students **Mean (SD)**	Lecturers **Mean (SD)**
1	Enhanced Digital Literacy	2.30 (1.15)	2.20 (1.10)
2	Improved Critical Thinking	2.25 (1.10)	2.10 (1.08)
3	Improved Grades	2.40 (1.18)	2.35 (1.15)
4	Advanced Problem-Solving Abilities	2.20 (1.05)	2.10 (1.00)
5	Technical Proficiency	2.45 (1.22)	2.30 (1.15)
6	Enhanced Collaboration	2.35 (1.10)	2.20 (1.12)
7	Positive Attitudes Toward Learning	2.50 (1.25)	2.40 (1.20)

The results in Table 3 reflect the **perceived effects of ICT tool usage** on key educational outcomes. Across all seven dimensions, both students and lecturers reported **mean scores below 3.0**, indicating that the **benefits of ICT are not being fully realized** due to underutilization. The mean values (ranging from 2.10 to 2.50) suggest that respondents believe ICT usage **has not significantly enhanced learning or teaching**. The low ratings correlate with previously reported underutilization of ICT tools, reinforcing the idea that **limited integration leads to diminished educational benefits**.

Items such as **Improved Critical Thinking** (students: 2.25; lecturers: 2.10) and **Problem-Solving Abilities** (students: 2.20; lecturers: 2.10) had some of the lowest ratings. This suggests that ICT is **not being leveraged effectively to foster cognitive skill development**, which is one of its key advantages in modern education. The slightly higher mean scores for **Technical Proficiency** and **Positive Attitudes Toward Learning** (students: 2.45 and 2.50) indicate that **some students** may benefit from basic ICT exposure. However, the gains remain modest due to inconsistent or inadequate use. As in earlier results, **both groups closely align** in their responses, reinforcing the conclusion that **ICT's potential is being underexploited institution-wide** rather than limited to one user group.

These findings confirm that **underutilization of ICT tools negatively impacts educational outcomes (**Yasin et al. 2023). Students and lecturers alike recognize that minimal engagement with digital technologies translates to **weaker digital literacy, limited critical thinking, and suboptimal academic performance (**Akintayo, et al, 2024). If educational institutions aim to improve student outcomes, strategic investment in ICT integration, along with training and curriculum redesign, is essential (Abubakar et al., 2024; Vargas-Montoya et al., 2023).

Research Question 3: What are the key challenges institutions face in implementing ICT?

To understand the factors hindering effective ICT integration in teaching and learning, both students and lecturers were asked to rate the severity of various challenges they encounter. Responses were measured on a Likert scale (e.g., 1 = Not a challenge, 5 = Very severe challenge), and the mean and standard deviation (SD) were calculated for each item.

Table 4: Mean and Standard Deviation of ICT Utilization Challenges

S/ N	Challenge	Students **Mean (SD)**	Lecturers **Mean (SD)**
1	Unreliable Power Supply	4.10 (0.95)	4.25 (0.85)
2	Poor Internet Connectivity	4.20 (0.88)	4.15 (0.90)
3	Lack of ICT Support Services	3.90 (1.00)	4.00 (0.95)
4	Limited Hardware and Software Facilities	3.85 (1.05)	3.95 (1.00)
5	Insufficient ICT Training for Staff and Students	4.00 (0.92)	4.10 (0.90)

The results in Table 4 reveal that both students and lecturers **consistently experience significant challenges** in utilizing ICT tools within tertiary institutions. All mean values are **above 3.80**, indicating these issues are **perceived as serious barriers** to effective ICT adoption.

Infrastructure Challenges such as Unreliable Power Supply (students: 4.10; lecturers: 4.25) and **Poor Internet Connectivity** (students: 4.20; lecturers: 4.15) were ranked as the **most critical challenges**. These foundational infrastructure issues severely limit access to digital tools and platforms, particularly in synchronous learning or resource-intensive applications. Both groups reported concern over the **lack of ICT support services** (students: 3.90; lecturers: 4.00). This reflects a gap in institutional readiness to assist users with technical issues or system navigation, further discouraging tool usage. **Limited hardware and software availability** was also cited as a barrier (students: 3.85; lecturers: 3.95), suggesting that even basic ICT tools are not adequately provided. Insufficient **ICT training** for both staff and students was rated as a major concern (students: 4.00; lecturers: 4.10). Without structured training programs, users are less likely to explore or maximize the available technologies, perpetuating underutilization (Bećirović, 2023). The alignment of responses between both groups reinforces the conclusion that these challenges are **institution-wide and not group-specific**. This consistency suggests that strategic solutions must involve **systemic changes**, not just user-level adjustments.

The data clearly indicate that **institutional, infrastructural, and human capacity challenges** are major barriers to effective (Widowati et al., 2023; Anike, 2024) ICT integration in tertiary education. Addressing these issues, particularly by improving internet access, providing stable electricity, offering training, and ensuring technical support, will be essential for unlocking the full potential of ICT in teaching and learning environments.

To determine whether there is a statistically significant difference between students' and lecturers' perceptions regarding the impact of ICT usage on academic performance, an independent samples t-test was conducted using the variable "Improved Grades" as the primary indicator.

Hypotheses:

H_0: There is no significant difference between students' and lecturers' perceptions of the impact of ICT usage on academic performance.

Table 5: T-Test Summary Table –: ICT Usage and Academic Performance

Group	N	$\bar{X}$ (Mean)	SD	Df	t-cal	t-crit ($\alpha = 0.05$)	Inference
Students	300	2.40	1.18	348	0.295	1.967	Not Significant
Lecturers	50	2.35	1.15				

The t-test result shows that the calculated t-value (t = 0.295) is less than the critical value (t-crit = 1.967) at 348 degrees of freedom. Therefore, the null hypothesis is accepted. This means there is no statistically significant difference between the two groups' perceptions of how ICT impacts academic performance.

Although students rated the impact slightly higher (Mean = 2.40), both values remain low, indicating a shared perception that ICT tools are currently underutilized and do not significantly contribute to academic improvement.

Conclusion and Recommendation

This study reveals that while ICT tools hold significant potential to enhance learning outcomes in Nigerian tertiary institutions, their actual integration and impact remain limited. Both students and lecturers reported infrequent use of most ICT tools, with notable underutilization of advanced technologies such as virtual reality and AI platforms. Perceived educational benefits, including improvements in digital literacy and academic performance, were modest, largely due to systemic barriers such as unreliable power supply, poor internet connectivity, and inadequate training. These findings underscore the urgent need for comprehensive infrastructure development, user training, and institutional support to fully realize the transformative potential of ICT in higher education.

To address the underutilization of ICT tools in tertiary education and enhance their impact on academic performance, institutions should:

1. **Invest in ICT infrastructure** including reliable power and internet.
2. **Provide regular ICT training** for both staff and students.
3. **Integrate ICT tools into teaching and curricula** to improve engagement.
4. **Establish ICT support services** to aid tool usage and maintenance.
5. **Raise awareness** about the educational benefits of ICT tools.
6. **Encourage innovative learning methods**, such as gamification and virtual reality.
7. **Monitor and evaluate** ICT implementation to guide future improvements.

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