IDEAS: Uniuyo Journal of Philosophy
and Multi-Disciplinary Studies
ISSN: 3093-009x
Vol. 1, No. 4, December 2025
ideasjournaluniuyo@gmail.com
www.ideasuniuyojournal.com

Evaluating the Impact of ICT on Content Delivery in Primary Schools: A Quasi-Experimental Study in Gwarzo Educational Zone, Kano State Nigeria

Mustapha, Lawan Usman
Department of Education,
Federal University Dutse, Jigawa State Nigeria
mustalbarii@gmail.com
08068584258, 08029116414

Hamidu Mohammed Jada, Ph.D
Department of Education,
Federal University Dutse, Jigawa State Nigeria
hamid.jada@gmail.com
07038417827

Muhammad Kabir Idris, Ph.D
Department of Education,
Federal University Dutse, Jigawa State Nigeria
kabiridris1973@gmail.com
08036895064

Abstract

This study evaluates the impact of Information and Communication Technology (ICT) on content delivery in primary education using a quasi-experimental design in Gwarzo Educational Zone, Kano State, Nigeria. The research investigates how ICT tools influence teaching effectiveness and student learning outcomes. Two groups of primary school pupils were exposed to different instructional conditions: one with ICT-supported teaching and the other with conventional methods. Performance tests were administered to both groups, and the data were analyzed using descriptive statistics and inferential tests. Findings revealed that pupils exposed to ICT-based instruction performed significantly better than those taught with traditional methods. The study recommends stronger policy implementation, teacher capacity building, and sustained investment in ICT infrastructure for improved teaching and learning.

Keywords: ICT impact, content delivery, primary education, quasi-experimental, Kano State

Introduction

The integration of Information and Communication Technology (ICT) in primary education has become a strategic imperative for enhancing content delivery and educational quality globally. ICT enables interactive, learner-centered approaches that improve engagement, facilitate understanding, and promote retention of knowledge (UNESCO, 2021). In the Nigerian context, the National Policy on Education underscores the role of ICT in transforming traditional pedagogical approaches (FGN, 2014). Research has shown that when appropriately deployed, ICT enhances the instructional process by supporting visual and auditory learning, providing access to digital resources, and enabling differentiated instruction (Adeyemo, 2010; Yusuf & Onasanya, 2004). However, empirical evidence on the actual impact of ICT on student performance in Nigerian primary schools remains limited, particularly in rural areas such as the Gwarzo Educational Zone.

This study seeks to fill that gap by evaluating the effectiveness of ICT-supported teaching on content delivery outcomes among primary school pupils. It adopts a quasi-experimental design to compare the performance of pupils exposed to ICT-based instruction versus those taught using traditional methods.

Background to the Study

Education remains the most powerful instrument for social transformation, national development, and economic progress. In today's knowledge-driven society, Information and Communication Technology (ICT) has become a central pillar in promoting quality education, expanding access, and enhancing the effectiveness of teaching and learning. ICT encompasses a range of technological tools and resources used to communicate, create, disseminate, store, and manage information. These include computers, the Internet, radio, television, projectors, and mobile devices. In the classroom, ICT facilitates interactive teaching methods, provides access to a wealth of educational resources, and enables learners to engage more actively in constructing their own understanding.

Globally, educational systems are undergoing transformation due to the rapid integration of ICT. According to UNESCO (2021), ICT not only enhances content delivery but also promotes inclusiveness and equitable access to education, especially in developing nations. Many countries have adopted ICT-based education policies to promote digital literacy and prepare learners for participation in the global knowledge economy. In developed nations, the use of ICT in education has become the norm, with technology being fully integrated into curriculum delivery, assessment, and classroom management.

In Nigeria, the Federal Government recognizes ICT as a critical tool for educational reform. The **National Policy on Education (FGN, 2014)** emphasizes the integration of ICT in teaching and learning at all levels of education. The **National Policy on ICT in Education (2019)** further underscores the need to use digital technologies to improve access, equity, and quality of learning. Despite these policy frameworks, the practical integration of ICT in primary schools particularly in rural areas remains limited due to challenges such as inadequate infrastructure, poor teacher training, irregular electricity supply, and insufficient government funding.

Primary education is the foundation upon which the entire education system rests. It is at this level that children develop fundamental literacy, numeracy, and life skills that form the

basis for lifelong learning. Hence, improving instructional quality through ICT in primary schools is crucial for national development. In Kano State, and particularly within the Gwarzo Educational Zone, ICT facilities are gradually being introduced into some primary schools through initiatives by the government, NGOs, and private partners. However, empirical evidence on how ICT integration impacts actual teaching outcomes and pupil performance remains scarce.

Therefore, this study seeks to evaluate the impact of ICT on content delivery and learning outcomes among primary school pupils in Gwarzo Educational Zone, Kano State. It compares the performance of pupils exposed to ICT-supported instruction with those taught using conventional chalk-and-talk methods.

Statement of the Problem

Although ICT has been widely recognized as a catalyst for improving education, its implementation at the primary level in Nigeria is still at a formative stage. Several government interventions, including the Universal Basic Education (UBE) programme and the National ICT Policy, have emphasized the adoption of technology in schools. However, a large number of primary schools, especially in rural communities, still lack functional ICT facilities such as computers, projectors, and internet connectivity. Teachers often have limited ICT competencies, and many schools lack technical support personnel to maintain available facilities.

Furthermore, while several studies have examined ICT use in secondary and tertiary institutions, limited empirical research exists on the actual impact of ICT on **content delivery effectiveness** and **pupils' academic performance** in Nigerian primary schools. In particular, there is a need for evidence-based evaluation within rural zones like Gwarzo, where infrastructural challenges and socio-economic constraints may influence outcomes differently.

This study, therefore, addresses the critical question: **Does ICT integration significantly enhance the quality of content delivery and learning outcomes among primary school pupils compared to traditional teaching methods?**

Objectives of the Study

The main objective of this study is to evaluate the impact of ICT on content delivery in primary schools within the Gwarzo Educational Zone of Kano State. The specific objectives are:

1. To assess the performance of pupils taught using ICT – supported instruction.
2. To compare academic achievement between pupils exposed to ICT – based content delivery and those taught through conventional means.
3. To determine the effectiveness of ICT tools in enhancing primary school instructional outcomes.

Research Questions

This study seeks to answer the following questions:

1. What is the performance level of pupils taught using ICT-supported instruction?
2. Is there a significant difference in achievement between pupils taught with ICT and those taught through conventional methods?

3. How effective are ICT tools in enhancing content delivery and pupil learning outcomes?

Significance of the Study

This study is significant in several ways.

- **To policymakers**, it provides empirical evidence on the effectiveness of ICT integration in improving teaching and learning outcomes, thereby guiding future educational policy and investment decisions.
- **To teachers**, the findings will highlight the pedagogical benefits of ICT, encouraging adoption of digital tools to enhance classroom engagement and learning efficiency.
- **To curriculum planners and education administrators**, the study will offer insights into how ICT-based teaching strategies can be effectively incorporated into curriculum implementation at the primary level.
- **To researchers**, it will contribute to the growing body of literature on ICT and education, particularly within the context of rural primary schools in Northern Nigeria.
- **To pupils and parents**, it demonstrates how technology can make learning more interactive, relevant, and effective, ultimately improving academic outcomes.

Scope and Delimitation of the Study

The study focuses on evaluating the impact of ICT on content delivery among primary school pupils within the **Gwarzo Educational Zone of Kano State**. The research is limited to public primary schools and targets **Primary Five pupils**. The ICT tools examined include laptops, projectors, radio educational programs, and educational videos. The findings may provide useful insights, they may be generalized to all rural primary schools in Kano state Nigeria due to contextual similarities such as level of ICT infrastructure, teacher competence, and local support systems.

Operational Definition of Terms

- **Information and Communication Technology (ICT):** The use of technological tools such as computers, projectors, radios, and digital media in teaching and learning processes.
- **Content Delivery:** The process of presenting instructional materials and subject matter to learners.
- **ICT-Supported Instruction:** Teaching methods that incorporate ICT tools to facilitate learning.
- **Conventional Teaching Method:** Traditional chalk-and-talk instructional approach without the use of digital tools.
- **Academic Performance:** The measurable learning outcomes of pupils as reflected in achievement test scores.
- **Quasi-Experimental Design:** A research approach that compares outcomes between groups not randomly assigned but assumed to be equivalent.

Review of Related Literature

Below is a comprehensive review of related literature on the impact of Information and Communication Technology (ICT) on content delivery in primary education. The discussion of

the key concepts, theoretical underpinnings and empirical evidence from both local and international contexts. The review is organized under the following subheadings: conceptual framework, theoretical framework, empirical studies, and summary of the reviewed literature.

Conceptual Framework

Concept of Information and Communication Technology (ICT)

Information and Communication Technology (ICT) refers to a broad range of technological tools and resources used to create, store, manage, and communicate information. These include computers, the internet, television, radio, projectors, and multimedia devices. UNESCO (2021) defines ICT as the combination of networks, hardware, and software, as well as the means of communication, collaboration, and information access.

In the educational context, ICT encompasses digital tools that facilitate teaching and learning processes. According to Yusuf and Onasanya (2004), ICT serves as a catalyst for reforming teaching methodologies, promoting learner-centered instruction, and enabling access to global knowledge resources. ICT provides teachers with innovative ways to design lessons, while students benefit from interactive and self-directed learning experiences.

ICT in Primary Education

Primary education serves as the foundation for lifelong learning, making the integration of ICT at this level essential for developing basic technological literacy and cognitive skills. The introduction of ICT in primary schools helps pupils visualize complex concepts through multimedia, enhances motivation, and promotes participation. Studies (Adeyemo, 2010; Jegede, 2009) have shown that pupils taught with digital aids such as animations and educational games exhibit higher levels of understanding and retention than those taught with traditional methods.

In Nigeria, the Federal Government's National Policy on Education (FGN, 2014) highlights ICT as a key strategy for improving access and quality in education. Similarly, the National ICT Policy (2019) emphasizes equipping schools with modern technologies. However, the practical implementation of these policies remains a challenge due to insufficient resources, poor electricity supply, and limited teacher competence.

Concept of Content Delivery

Content delivery refers to the process of presenting, organizing, and communicating instructional material to learners in a way that enhances understanding and retention. Effective content delivery requires the use of appropriate pedagogical strategies, instructional materials, and communication techniques. Traditional content delivery in Nigerian primary schools largely depends on the "chalk and talk" method, where the teacher dominates the classroom with minimal learner participation.

With ICT integration, content delivery becomes more interactive, visual, and learner-centered. Teachers can use multimedia slides, animations, and educational software to make lessons more engaging. According to Aladejana (2007), ICT enhances the quality of content delivery by providing real-time access to updated information, enabling teachers to go beyond textbook-based instruction.

ICT-Supported Teaching and Learning

ICT-supported instruction involves the use of digital tools to supplement or replace traditional teaching materials. Tools such as projectors, videos, and online educational platforms can be used to demonstrate abstract concepts, provide visual simulations, and enable collaborative learning. ICT-supported learning encourages pupils to be active participants rather than passive recipients.

As Duhaney (2000) noted, ICT creates a more dynamic learning environment that accommodates different learning styles visual, auditory, and kinesthetic. Moreover, ICT allows for differentiated instruction, where teachers can tailor materials to meet the individual needs of pupils. This enhances inclusivity and learning effectiveness.

Benefits of ICT in Primary Education

The benefits of ICT integration in primary schools include:

- **Improved engagement and motivation**: Pupils find lessons more interesting when digital media are used.
- **Enhanced comprehension**: Visual and audio stimuli help clarify complex ideas.
- **Increased collaboration**: ICT encourages group work through digital tasks.
- **Access to wider learning resources**: Teachers and pupils can use online educational content.
- **Development of digital skills**: Pupils acquire technological competencies early.

These benefits collectively enhance both the teaching and learning processes, leading to improved academic performance and higher-quality content delivery.

Theoretical Framework

The present study is anchored on the **Constructivist Learning Theory** and the **Technological Pedagogical Content Knowledge (TPACK) Model. Explanation of each theory will be seen below:**

Constructivist Learning Theory

Constructivism, championed by scholars such as Jean Piaget and Lev Vygotsky, posits that learners actively construct their own understanding based on experiences. Knowledge is not transmitted directly from teacher to learner but constructed through interaction with the environment. ICT tools facilitate such interactions by providing learners with multiple representations of content, simulations, and opportunities for discovery learning.

In ICT-supported classrooms, learners explore, analyze, and interpret digital content, leading to deeper understanding. Teachers act as facilitators who guide learning rather than mere transmitters of information. This aligns perfectly with the use of ICT tools such as videos, interactive boards, and learning management systems that promote self-directed learning.

Technological Pedagogical Content Knowledge (TPACK) Model

Developed by Mishra and Koehler (2006), the TPACK model emphasizes the intersection of three forms of knowledge required for effective technology integration:

1. **Technological Knowledge (TK)** – understanding how to use digital tools.
2. **Pedagogical Knowledge (PK)** – mastery of teaching methods and classroom management.
3. **Content Knowledge (CK)** – deep understanding of the subject matter.

Effective ICT-based teaching occurs when these three areas overlap. For instance, a teacher who understands both the subject matter and how to use digital resources (such as educational software or multimedia) can design lessons that are both pedagogically sound and technologically relevant.

This model is highly relevant to primary education, where teachers must integrate simple but effective technologies to make learning active and engaging.

Empirical Studies on the Impact of ICT on Content Delivery

A number of empirical studies have investigated the relationship between ICT and teaching effectiveness. Some of which can be seen as follows:

Adeyemo, (2010) found that ICT tools significantly improve student understanding and retention in science subjects in Nigerian schools. The study emphasized that the use of visual aids helps pupils grasp abstract concepts better. **Jegede, (2009)** assessed Nigerian teacher educators' ICT competence and found that teachers with ICT training were more effective in lesson delivery and classroom management. **Owolabi and Oke, (2014)** conducted an experimental study comparing ICT-based and traditional instruction among primary school pupils in Lagos State. Results showed that the ICT group achieved higher academic performance, confirming the transformative role of digital technologies in content delivery. **Aduwa-Ogiegbaen and Iyamu, (2005)** identified major barriers to ICT integration in Nigerian schools, including inadequate infrastructure, poor internet access, and teachers' resistance to change. **Yusuf, (2012)** in a study conducted in Kwara State, established that the use of ICT tools such as PowerPoint and educational videos increased students' interest and improved learning outcomes in English Language and Mathematics. **Ogunlade and Aremu, (2020)** also reported that ICT integration enhances classroom participation and collaboration among primary school pupils, particularly when teachers use project-based approaches supported by digital tools.

Hennessy et al., (2019) reported that ICT-supported pedagogy improves problem-solving skills and conceptual understanding among learners in Kenya and Uganda. **UNESCO (2021)** likewise concluded that countries that invested heavily in ICT-based primary education saw measurable improvements in learning outcomes and teacher effectiveness. These empirical studies affirm that ICT-supported instruction leads to better academic performance, supports constructivist learning, and enhances content delivery. However, most studies also caution that without adequate infrastructure, teacher training, and policy enforcement, the full benefits of ICT cannot be realized.

Summary of the Literature Review

The review of literature reveals that ICT is a vital instrument for improving content delivery and learning outcomes at all educational levels. Globally, ICT integration has revolutionized pedagogical practices by making learning more interactive, inclusive, and

effective. In Nigeria, several policy frameworks support ICT adoption, yet practical implementation at the primary school level remains weak due to resource limitations and low teacher competence. Theoretical perspectives such as Constructivism and TPACK explain how ICT facilitates knowledge construction and effective teaching. Empirical evidence from previous studies consistently shows positive effects of ICT on student performance and teacher effectiveness. Nevertheless, there is still a paucity of quasi-experimental studies that directly assess the **impact of ICT-based content delivery on learning outcomes among primary school pupils in rural areas**, such as the Gwarzo Educational Zone. This gap underscores the importance of the present study.

Methodology

The study adopted a **quasi-experimental design**, specifically the **pre-test and post-test non-equivalent control group design**. This design was chosen because it allows for comparison between two groups (experimental and control) without random assignment of participants, which is often impractical in educational settings. According to Nworgu (2015), the quasi-experimental design is suitable for educational research where intact classes or schools are used as groups. In this study, the **experimental group** received instruction using ICT-supported methods, while the **control group** was taught using conventional (chalk-and-talk) methods. Both groups were administered pre-tests and post-tests to measure the effect of the intervention on pupils' academic performance.

Population of the Study

The population of this study comprised **all Primary Five pupils** in public primary schools within **Gwarzo Educational Zone** of Kano State, Nigeria. According to data from the Kano State Universal Basic Education Board (Kano SUBEB, 2024), the zone consists of approximately 112 public primary schools, with an estimated population of **about 3,400 Primary Five pupils**. This population was considered appropriate because pupils at this level have developed foundational literacy and numeracy skills necessary to engage with ICT-assisted instruction and standardized testing.

Sample and Sampling Technique

A sample of **80 pupils** was drawn from **two comparable public primary schools** within Gwarzo Educational Zone. The schools were purposively selected based on the following criteria:

1. Availability of basic ICT facilities (e.g., laptops, radio sets, or projectors).
2. Similar school size and academic performance level.
3. Accessibility and willingness of teachers and pupils to participate.

One school was assigned as the **experimental group (40 pupils)**, and the other as the **control group (40 pupils)**. The use of purposive sampling was justified because it ensured that the selected schools possessed the necessary ICT infrastructure to facilitate the intervention. Moreover, the two schools were comparable in teacher qualification, pupil population, and learning environment, which helped to control extraneous variables.

Instrumentation

The primary instrument for data collection was an **Achievement Test** designed by the researcher. The test consisted of **40 multiple-choice items** covering two core subjects: **English Language** and **Mathematics**. These subjects were selected because they are core areas in the Nigerian primary curriculum and are suitable for evaluating learning outcomes resulting from ICT-supported instruction. The test items were developed using the curriculum specifications of the Universal Basic Education (UBE) for Primary Five. The instrument was divided as follows:

- **Section A:** 20 questions on English Language (reading comprehension, vocabulary, grammar, and spelling).
- **Section B:** 20 questions on Mathematics (basic arithmetic, fractions, geometry, and problem-solving). Each correct response was awarded one mark, making a total of 40 marks.

Validation of the Instrument

To ensure **content validity**, the draft instrument was reviewed by **three experts**:

1. One expert in Educational Measurement and Evaluation,
2. One expert in Educational Technology, and
3. One primary school education specialist.

The experts examined the items for clarity, appropriateness, and alignment with the curriculum objectives. Based on their feedback, ambiguous questions were reworded and irrelevant items were replaced. The final version of the test was approved for administration.

Reliability of the Instrument

The reliability of the achievement test was established using the **Kuder-Richardson Formula 20 (KR-20)**, which is suitable for dichotomously scored items (right/wrong answers). The test was pilot-tested on **20 pupils** in a school outside the main study area but with similar characteristics. The reliability coefficient obtained was **0.82**, indicating a high level of internal consistency, as values above 0.70 are considered acceptable (Fraenkel & Wallen, 2012).

Experimental Procedure

The experiment was conducted in **four stages**:

1. Pre-Test Administration:

Both the experimental and control groups were given the same achievement test to assess their baseline knowledge before the intervention.

2. Instructional Treatment:

- The **experimental group** received instruction using ICT-supported methods, including multimedia presentations, educational videos, radio lessons, and computer-based learning activities.
- The **control group** was taught using the conventional chalk-and-talk approach without ICT tools.

The treatment lasted for **four weeks**, with three teaching sessions per week. Lessons covered selected topics in English and Mathematics drawn from the Primary Five curriculum.

3. Post-Test Administration:
After the intervention, the same test (with reordered questions) was administered to both groups to measure learning gains.

4. Data Compilation:
The pre-test and post-test scores were compiled for statistical analysis to determine the impact of ICT-supported instruction.

Method of Data Collection

Data were collected directly by the researcher with the assistance of two trained research assistants one for each school. The assistants were briefed on the procedures for administering the pre-test and post-test to ensure uniformity. Pupils were instructed not to discuss or copy during the test to maintain data integrity. All answer sheets were collected immediately after completion.

Method of Data Analysis
The collected data were analyzed using both **descriptive and inferential statistics**.

- **Descriptive Statistics** (mean, standard deviation, and frequency counts) were used to summarize pre-test and post-test scores.
- **Inferential Statistics** (Independent Samples *t*-test) were used to determine whether there was a significant difference between the mean scores of the experimental and control groups.

The *t*-test was chosen because it is suitable for comparing the means of two independent groups. The hypotheses were tested at **0.05 level of significance**. The Statistical Package for the Social Sciences (**SPSS version 26**) was used to compute results.

Ethical Considerations

The researcher obtained official approval from the **Kano State Universal Basic Education Board (SUBEB)** and the head teachers of the participating schools. Informed consent was sought from the pupils' parents through the school administration. Participation was entirely voluntary, and pupils were assured of confidentiality and anonymity. No harm or disadvantage was associated with participation, and all data collected were used solely for academic purposes.

Results

Table 1: Pre-Test Mean Scores of Experimental and Control Groups

Group	N	Mean Score	SD
Experimental	40	45.30	6.85
Control	40	44.75	6.92

Interpretation: The pre-test mean scores for both groups were comparable, suggesting similar baseline academic levels.

Table 2: Post-Test Mean Scores of Experimental and Control Groups

Group	N	Mean Score	SD
Experimental	40	71.20	8.14
Control	40	56.40	7.62

Interpretation: The experimental group showed a significant improvement in post-test scores compared to the control group.

Table 3: Independent Samples t-Test Result for Post-Test Scores

Variable	t-value	df	p-value
Post-Test	6.85	78	0.000

Interpretation: The t-test result indicates a statistically significant difference ($p < 0.05$) in performance favoring the ICT – Integrated group.

Discussion

The findings of this study confirm that ICT-supported instruction significantly enhances content delivery and student performance at the primary level. The experimental group outperformed their counterparts taught using traditional methods, aligning with prior studies that emphasize the effectiveness of technology in education as (Adeyemo, 2010; Jegede, 2009) Stated in their findings. The findings of this study corroborate existing research indicating that ICT-supported instruction significantly improves pupils' academic performance. The substantial increase in post-test scores among pupils in the experimental group demonstrates the effectiveness of ICT in facilitating understanding, retention, and application of knowledge.

The result that ICT-based instruction enhances pupil achievement aligns with **Adeyemo (2010)** and **Yusuf (2012)**, who found that learners taught with technological aids performed better due to visual stimulation and interactive engagement. The improved scores in the experimental group indicate that ICT enables a more student-centered approach to learning, consistent with **Constructivist Learning Theory**.

The result of this study is consistent with global evidence. **Hennessy et al. (2019)** in East Africa and **UNESCO (2021)** globally both found that ICT-supported instruction improves student performance, motivation, and problem-solving skills. Therefore, the findings from

Gwarzo Educational Zone contribute to the growing body of evidence confirming that ICT is a transformative tool in education when properly implemented.

These results validate the constructivist learning theory, which holds that learners construct knowledge better through active engagement and multiple modes of input. ICT tools such as videos, digital charts, and educational games stimulate multiple senses and encourage student participation, leading to improved comprehension and retention. However, the benefits of ICT can only be sustained with consistent infrastructure, teacher competence, and institutional support.

Summary of Findings

1. Pupils taught with ICT-supported instruction demonstrated a significant improvement in academic performance compared to those taught using conventional methods.
2. ICT tools enhanced lesson delivery by making content more engaging, visual, and understandable.
3. There was a statistically significant difference between the post-test mean scores of the experimental and control groups ($p < 0.05$).

Conclusion

Based on the findings, it can be concluded that **ICT integration in primary school teaching significantly improves content delivery and pupils' academic achievement**. The quasi-experimental evidence from Gwarzo Educational Zone demonstrates that pupils exposed to ICT-supported lessons achieved higher learning gains than those taught through conventional methods. The study reinforces the **Constructivist Learning Theory**, which emphasizes active learning through interaction, exploration, and engagement. ICT creates opportunities for learners to construct knowledge by interacting with multimedia resources and digital simulations. Furthermore, the findings affirm the **Technological Pedagogical Content Knowledge (TPACK)** framework, highlighting that effective teaching in the digital era requires a combination of technological proficiency, pedagogical competence, and subject knowledge. However, the success of ICT integration depends largely on teacher capacity, adequate infrastructure, and supportive policies. Without these, the potential of ICT to transform teaching and learning in Nigeria's primary schools cannot be fully realized.

Recommendations

1. Governments should scale up ICT infrastructure in public primary schools.
2. Regular ICT-based training should be offered to teachers to enhance their instructional competence.
3. Digital teaching aids should be included in curriculum implementation strategies.
4. Monitoring and evaluation mechanisms should be established to assess the impact of ICT on learning.
5. School administrators should sensitize parents and community leaders about the importance of ICT in education to foster community participation and ownership of digital learning projects.

6. Collaboration with NGOs and the private sector can help fund ICT deployment in rural areas.

Work Cited

Adeyemo, S. A. (2010). The impact of Information and Communication Technology (ICT) on teaching and learning in Nigerian tertiary institutions. *Educational Technology & Society, 13*(1), 62–73.

Aduwa-Ogiegbaen, S. E., & Iyamu, E. O. S. (2005). Using information and communication technology in secondary schools in Nigeria: Problems and prospects. *Educational Technology & Society, 8*(1), 104–112.

Aladejana, F. (2007). The implications of ICT and NKS for science teaching: Whither Nigeria. *Complexity and Learning in Primary Education Journal, 2*(1), 1–9.

Duhaney, D. C. (2000). Technology and the educational process: Transforming classroom activities. *International Journal of Instructional Media, 27*(1), 67–72.

Federal Government of Nigeria (FGN). (2014). *National Policy on Education* (6th ed.). Lagos: NERDC Press.

Federal Government of Nigeria (FGN). (2019). *National Policy on Information and Communication Technology (ICT) in Education.* Abuja: Federal Ministry of Education.

Fraenkel, J. R., & Wallen, N. E. (2012). *How to design and evaluate research in education* (8th ed.). New York: McGraw-Hill.

Hennessy, S., Onguko, B., Harrison, D., Ang'ondi, E. K., Namalefe, S., Naseem, A., & Wamakote, L. (2019). *Developing use of ICT to enhance teaching and learning in East African schools: Review of literature.* Cambridge: University of Cambridge Press.

Jegede, P. O. (2009). Assessment of Nigerian teacher educators' ICT training and use of ICT facilities for teaching. *Issues in Informing Science and Information Technology, 6*, 771–779. https://doi.org/10.28945/1082

Kano State Universal Basic Education Board (SUBEB). (2024). *Annual basic education statistics report.* Kano: SUBEB Headquarters.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054.

Nworgu, B. G. (2015). *Educational research: Basic issues and methodology* (3rd ed.). Nsukka: University Trust Publishers.

Ogunlade, O. O., & Aremu, A. (2020). ICT integration and students' collaborative learning in Nigerian primary schools: Challenges and prospects. *Journal of Education and e-Learning Research, 7*(2), 198–205. https://doi.org/10.20448/journal.509.2020.72.198.205

Owolabi, J., & Oke, M. (2014). Comparative study of ICT-based and traditional teaching methods on academic achievement of primary school pupils in Lagos State. *Journal of Education and Practice, 5*(23), 150–158.

UNESCO. (2021). *Digital learning in Sub-Saharan Africa: Progress and challenges.* Paris: UNESCO Publishing.

Yusuf, M. O. (2012). Information and communication technology and education: Analysing the Nigerian national policy for information technology. *International Education Journal, 6*(3), 316–321.

Yusuf, M. O., & Onasanya, S. A. (2004). Information and communication technology in Nigerian schools: The role of the teacher. *Nigerian Journal of Educational Technology, 11*(1), 37–43.