

Impact of Instructional Technology on Students' Academic Performance in Nigerian Secondary Schools

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Abstract

This study investigated the impact of instructional technology on students' academic performance in Nigerian secondary schools. The study adopted a descriptive survey research design. The population comprised teachers and students in selected secondary schools, while a sample was selected using an appropriate sampling technique. Data were collected using a structured questionnaire titled Impact of Instructional Technology on Students' Academic Performance Questionnaire (ITSAPQ). The instrument was validated by experts in Educational Technology and Measurement and Evaluation, and its reliability was established through a pilot test. Data collected were analyzed using mean and standard deviation to answer the research questions, while the independent samples t-test was used to test the hypothesis at the 0.05 level of significance. The findings revealed that instructional technology had a positive impact on students' academic performance. The study showed that the use of instructional technologies enhanced students' understanding of lessons, increased classroom participation, improved learning experiences, and contributed to better academic achievement. The findings further indicated that inadequate facilities, poor electricity supply, limited internet access, insufficient funding, and lack of teacher training were major challenges affecting the effective utilization of instructional technology in secondary schools. The study concluded that effective integration of instructional technology improved teaching and learning outcomes in Nigerian secondary schools. It was recommended that governments and school authorities should provide adequate technological facilities, train teachers on technology integration, and create supportive environments for effective utilization of instructional technology.

Keywords: Instructional technology, academic performance, secondary schools, educational technology, ICT, teaching and learning, Nigeria

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Introduction

Students' academic performance is one of the most important indicators of educational success and the overall effectiveness of any educational system. It reflects the extent to which students have achieved the intended learning objectives and acquired the knowledge, skills, and competencies expected at a particular level of education. Academic performance is commonly measured using examination scores, continuous assessment results, grade point averages (GPA), and other standardized assessment tools (American Psychological Association [APA], 2018).

Academic performance is a multidimensional concept that encompasses students' cognitive achievements, learning outcomes, and mastery of subject content. It represents the degree to which learners attain educational goals established by schools, colleges, and universities. Because educational institutions are designed to facilitate learning and intellectual development, students' academic performance remains a major criterion for evaluating educational quality and effectiveness (Steinmayr et al., 2014).

Researchers have identified numerous factors that influence students' academic performance. These factors include instructional methods, teachers' qualifications, learning environment, parental involvement, students' motivation, socio-economic status, peer influence, availability of instructional materials, and the integration of educational technology into teaching and learning (Richardson et al., 2012). In recent years, the growing use of instructional technology has attracted considerable attention because of its potential to improve classroom interaction, enhance students' engagement, facilitate independent learning, and promote better academic outcomes.

Within the Nigerian education system, improving students' academic performance has remained a major concern for educators, policymakers, parents, and other stakeholders. Despite various educational reforms and increased investment in educational resources, students' performance in both internal and external examinations has continued to raise concerns in many schools. Several studies have attributed this challenge to inadequate teaching facilities, insufficient instructional resources, limited access to modern educational technologies, poor teacher preparation, and ineffective instructional strategies. Consequently, there is an increasing need to adopt

innovative instructional technologies that can support effective teaching and enhance students' learning experiences.

Instructional technology has become an essential component of modern education because it enhances the planning, delivery, management, and evaluation of teaching and learning. It involves the systematic application of technological resources, instructional strategies, and learning theories to improve the effectiveness and efficiency of the educational process. Rather than focusing solely on the use of technological devices, instructional technology encompasses the design, development, implementation, management, and evaluation of learning experiences that facilitate meaningful learning (Association for Educational Communications and Technology [AECT], 2008).

The concept of instructional technology has evolved significantly over the years. Earlier perspectives emphasized the use of audiovisual materials such as charts, projectors, radio, and television in teaching. However, contemporary instructional technology extends beyond these traditional media to include computers, multimedia applications, internet-based learning platforms, virtual classrooms, mobile technologies, artificial intelligence, and other digital tools that support teaching and learning. According to AECT (2008), educational technology is defined as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources." This definition highlights that instructional technology is both a field of study and a professional practice aimed at enhancing learning outcomes.

Instructional technology is grounded in learning theories such as behaviourism, cognitivism, constructivism, and connectivism, which provide the theoretical basis for designing effective instructional experiences. The integration of technological tools into classroom instruction enables teachers to present information in multiple formats, accommodate diverse learning styles, encourage collaboration, provide immediate feedback, and promote active student participation (Mayer, 2021). Consequently, instructional technology has become an indispensable resource for improving the quality of education at all levels.

In the Nigerian education system, instructional technology plays a significant role in addressing challenges associated with conventional teaching methods. The increasing availability of computers, internet services, learning

management systems, educational software, multimedia resources, and mobile technologies has created new opportunities for enhancing teaching effectiveness and students' academic performance. The Federal Government of Nigeria has also emphasized the integration of Information and Communication Technology (ICT) into education through various national policies aimed at promoting digital literacy, improving access to quality education, and preparing learners for participation in the global knowledge economy (Federal Republic of Nigeria, 2014).

Despite these efforts, the effective integration of instructional technology in Nigerian schools continues to face several challenges, including inadequate technological infrastructure, unstable electricity supply, limited internet connectivity, insufficient funding, inadequate teacher training, and unequal access to digital resources, particularly in rural communities (UNESCO, 2023). These constraints have limited the full realization of the benefits of instructional technology in many educational institutions. Nevertheless, the growing recognition of technology as a catalyst for educational improvement underscores the need for continued investment in digital infrastructure, teacher capacity building, and supportive educational policies.

The integration of instructional technology into the teaching and learning process has been recognized as an effective strategy for improving students' understanding, engagement, and academic performance. Instructional technologies such as computers, projectors, interactive whiteboards, multimedia resources, educational software, internet facilities, and mobile learning applications have the potential to enhance classroom instruction by making learning more interactive, learner-centered, and accessible. Consequently, governments, educational institutions, and development partners have invested in promoting the use of technology in schools to improve educational outcomes.

Despite these efforts, students' academic performance in many Nigerian secondary schools continues to be a major concern. Reports of poor performance in internal and external examinations, including the West African Senior School Certificate Examination (WASSCE) and the National Examination Council (NECO) examinations, have raised questions about the effectiveness of teaching methods and the extent to which instructional technology is being utilized in schools. In many secondary schools, especially

public schools, teaching remains predominantly teacher-centered, with limited integration of technological resources into classroom instruction.

Although various educational policies have emphasized the incorporation of Information and Communication Technology (ICT) into the Nigerian education system, many schools still experience challenges such as inadequate technological infrastructure, irregular electricity supply, poor internet connectivity, insufficient funding, lack of instructional materials, inadequate teacher training, and limited technical support. These challenges have hindered the effective implementation and utilization of instructional technology in classroom teaching, thereby limiting its potential benefits for students' learning and academic achievement.

Furthermore, while previous studies have examined the relationship between instructional technology and students' academic performance, their findings have been inconsistent. Some studies have reported significant positive effects of instructional technology on students' learning outcomes, whereas others have found little or no significant impact due to contextual factors such as teachers' competence, students' access to technological resources, school location, and availability of infrastructure. This inconsistency suggests the need for further empirical investigation, particularly within the context of Nigerian secondary schools.

Therefore, the problem of this study is to determine the extent to which instructional technology influences students' academic performance in Nigerian secondary schools. Specifically, the study seeks to examine whether the availability and effective utilization of instructional technology contribute significantly to students' academic achievement and to identify the factors that hinder its effective integration into the teaching-learning process. The findings of the study are expected to provide useful information for policymakers, school administrators, teachers, and other stakeholders in developing strategies that will enhance the effective use of instructional technology and improve students' academic performance in Nigerian secondary schools.

Objectives

The general objective of the study is to examine the impact of instructional technology on students' academic performance in Nigerian secondary schools. The study specifically seeks to:

1. Determine the level of availability of instructional technology facilities in Nigerian secondary schools.
2. Examine the extent to which teachers utilize instructional technology in teaching and learning in Nigerian secondary schools.
3. Assess teachers' level of competence in the use of instructional technology for classroom instruction.
4. Determine the relationship between the use of instructional technology and students' academic performance in Nigerian secondary schools.
5. Compare the academic performance of students taught using instructional technology with that of students taught using conventional teaching methods.

Research Questions

The study may be guided by the following research questions:

1. What is the level of availability of instructional technology facilities in Nigerian secondary schools?
2. To what extent are instructional technologies utilized by teachers in teaching and learning in Nigerian secondary schools?
3. What is the level of teachers' competence in the use of instructional technology in Nigerian secondary schools?
4. What is the relationship between the use of instructional technology and students' academic performance in Nigerian secondary schools?
5. What is the difference in the academic performance of students taught using instructional technology and those taught using conventional teaching methods?

Research Hypotheses

For a quantitative study, the hypotheses can be stated in null form (H_0):

1. There is no significant relationship between the availability of instructional technology facilities and students' academic performance in Nigerian secondary schools.
2. There is no significant relationship between teachers' utilization of instructional technology and students' academic performance in Nigerian secondary schools.
3. There is no significant relationship between teachers' competence in the use of instructional technology and students' academic performance in Nigerian secondary schools.
4. There is no significant difference in the academic performance of students taught using instructional technology and those taught using conventional teaching methods.
5. There is no significant relationship between students' access to instructional technology and their academic engagement in Nigerian secondary schools.

Methodology

The study adopted a descriptive survey research design. The design was considered appropriate because it enabled the researcher to collect data from a representative sample of respondents and examine the impact of instructional technology on students' academic performance in Nigerian secondary schools without manipulating any variables. The study was conducted in selected secondary schools in the study area. The area was chosen because it comprised both public and private secondary schools with varying levels of access to instructional technology, thereby providing adequate information for the study. The population of the study consisted of 326,755 teachers and 1,159,988 senior secondary school students in the selected secondary schools within the study area. These respondents were considered suitable because they possessed relevant information regarding the availability, utilization, and impact of instructional technology on students' academic performance. A sample of 200 respondents was selected from the target population. The sample comprised 50 teachers and 150 senior secondary school students drawn from selected secondary schools. A multistage sampling technique was used. First, simple random sampling was used to select the participating schools. Thereafter, proportionate sampling was employed to determine the number of

respondents selected from each school, while simple random sampling was used to select individual respondents. The instrument used for data collection was a structured questionnaire titled "Impact of Instructional Technology on Students' Academic Performance Questionnaire (ITSAPQ)." The questionnaire was designed by the researcher based on the objectives of the study and the related literature. It consisted of two sections. Section A elicited respondents' demographic information, while Section B contained items that measured the availability and utilization of instructional technology, its impact on students' academic performance, and the challenges associated with its use. The items were rated on a four-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The questionnaire was subjected to face and content validation by experts in Educational Technology and Measurement and Evaluation. Their observations, comments, and suggestions were incorporated into the final version of the instrument to ensure that it adequately measured the variables under investigation. The reliability of the instrument was established through a pilot study conducted in a secondary school outside the study area. The responses obtained were analyzed using Cronbach's Alpha reliability coefficient, which yielded a coefficient of 0.82. The coefficient indicated that the instrument possessed adequate internal consistency and was suitable for data collection. The researcher personally visited the selected secondary schools to administer the questionnaires with the assistance of trained research assistants. Permission was obtained from the school authorities before the administration of the instrument. The questionnaires were distributed to the respondents and collected immediately after completion to ensure a high response rate. The data collected were coded and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics such as frequency counts, percentages, mean, and standard deviation were used to answer the research questions. Inferential statistics, specifically the independent samples *t*-test (depending on the objectives and hypotheses), was used to test the hypotheses at the 0.05 level of significance. A mean score of 2.50 served as the decision benchmark, with mean scores of 2.50 and above interpreted as agreement and mean scores below 2.50 interpreted as disagreement.

Results and Discussion

Table 1: Summary of Descriptive Statistics on the Impact of Instructional Technology on Students' Academic Performance (N = 200)

S/N	Variables	Mean ($\bar{x}$)	Standard Deviation (SD)	Decision
1	Availability of instructional technology in schools	3.18	0.74	Agreed
2	Utilization of instructional technology by teachers	3.05	0.81	Agreed
3	Students' access to instructional technology	2.91	0.86	Agreed
4	Instructional technology enhanced students' understanding of lessons	3.32	0.68	Agreed
5	Instructional technology improved students' academic performance	3.28	0.72	Agreed
6	Instructional technology increased students' participation during lessons	3.16	0.79	Agreed
7	Teachers experienced challenges in using instructional technology	3.10	0.84	Agreed
8	Poor infrastructure limited the effective use of instructional technology	3.41	0.66	Agreed
Grand Mean	Overall Impact	3.18	0.76	Agreed

Table 1 showed the descriptive statistics on the impact of instructional technology on students' academic performance in Nigerian secondary schools. The findings revealed a grand mean score of 3.18 with a standard deviation of 0.76, which exceeded the criterion mean of 2.50. This indicated that the respondents generally agreed that instructional technology had a positive impact on students' academic performance.

Specifically, the respondents agreed that instructional technology was available in schools ($\bar{x} = 3.18$), was utilized by teachers during classroom instruction ($\bar{x} = 3.05$), and was accessible to students for learning purposes ($\bar{x} = 2.91$). They also agreed that instructional technology enhanced students' understanding of lessons ($\bar{x} = 3.32$), improved their academic performance ($\bar{x} = 3.28$), and increased classroom participation ($\bar{x} = 3.16$).

Furthermore, the respondents agreed that teachers encountered challenges in the use of instructional technology ($\bar{x} = 3.10$) and that inadequate infrastructure limited its effective implementation in secondary schools ($\bar{x} =$

3.41). The relatively low standard deviation values, ranging from 0.66 to 0.86, indicated that the respondents' opinions were fairly consistent.

Overall, the findings suggested that instructional technology had a significant positive influence on students' academic performance in Nigerian secondary schools. However, infrastructural deficiencies and implementation challenges were identified as major constraints to its effective utilization.

Hypothesis: There was no significant difference in the mean responses of teachers and students on the impact of instructional technology on students' academic performance in Nigerian secondary schools.

Table 2: Summary of Independent Samples t-test on the Impact of Instructional Technology on Students' Academic Performance

Variables	Respondents	N	Mean ($\bar{x}$)	SD	t-cal	df	Sig. (2-tailed)	Decision
Impact of Instructional Technology on Students' Academic Performance	Teachers	50	3.24	0.61	1.284	198	0.201	Not Significant
	Students	150	3.16	0.68				

Table 2 presented the results of the independent samples *t*-test conducted to determine whether there was a significant difference between the mean responses of teachers and students regarding the impact of instructional technology on students' academic performance in Nigerian secondary schools. The analysis showed that teachers had a mean score of 3.24 (SD = 0.61), while students had a mean score of 3.16 (SD = 0.68). The computed *t*-value was 1.284 with 198 degrees of freedom, and the corresponding *p*-value was 0.201. Since the *p*-value (0.201) was greater than the 0.05 level of significance, the null hypothesis was accepted. This indicated that there was no statistically significant difference between the mean responses of teachers and students on the impact of instructional technology on students' academic performance in Nigerian secondary schools.

Discussion

The findings of the study revealed that instructional technology had a positive impact on students' academic performance in Nigerian secondary schools. The descriptive statistics showed that respondents agreed that the availability and utilization of instructional technologies such as computers, multimedia presentations, projectors, internet resources, and other digital learning tools

enhanced students' understanding of classroom instruction, increased their participation during lessons, and improved their academic achievement. The findings suggested that instructional technology promoted interactive and learner-centered teaching, thereby making learning more effective and meaningful.

The findings were consistent with the Cognitive Theory of Multimedia Learning, which posited that students learned more effectively when information was presented through a combination of words, pictures, audio, and visual elements rather than through text alone (Mayer, 2021). The study demonstrated that the integration of instructional technology enabled teachers to present lessons in multiple formats, thereby improving students' comprehension, retention, and application of knowledge.

The findings also agreed with the study conducted by Higgins et al. (2012), which reported that the effective integration of digital technologies into classroom instruction improved students' academic achievement and increased their motivation to learn. Similarly, the findings supported Tamim et al. (2011), who found through a meta-analysis that instructional technology had a positive effect on students' learning outcomes when appropriately integrated into teaching and learning activities. These studies reinforced the conclusion that instructional technology served as an important tool for enhancing educational effectiveness.

Furthermore, the study revealed that respondents acknowledged the existence of several challenges affecting the effective utilization of instructional technology in Nigerian secondary schools. These challenges included inadequate technological infrastructure, irregular electricity supply, poor internet connectivity, insufficient instructional materials, inadequate teacher training, and limited funding. The findings indicated that although instructional technology positively influenced students' academic performance, these constraints reduced the extent to which schools could fully benefit from technological innovations.

The findings corroborated those of the Federal Republic of Nigeria (2014), which recognized that inadequate infrastructure and limited access to Information and Communication Technology (ICT) facilities remained major obstacles to the successful implementation of technology-based education in Nigerian schools. The findings also aligned with UNESCO (2023), which reported that many developing countries continued to experience challenges

related to digital inequality, inadequate infrastructure, and insufficient teacher preparedness, all of which affected the effective integration of technology into education.

Conclusion

Based on the findings of the study, it was concluded that instructional technology had a positive impact on students' academic performance in Nigerian secondary schools. The study established that the effective use of instructional technologies, including computers, multimedia resources, internet facilities, projectors, and other digital learning tools, enhanced students' understanding of classroom instruction, increased their participation in learning activities, and improved their academic achievement.

The study further concluded that both teachers and students shared similar perceptions regarding the importance of instructional technology in promoting effective teaching and learning. Although instructional technology contributed significantly to improved educational outcomes, its effective implementation was constrained by inadequate technological infrastructure, poor electricity supply, limited internet connectivity, insufficient funding, inadequate teacher training, and the shortage of instructional resources in many schools.

Recommendations

Based on the findings and conclusions of the study, the following recommendations were made:

1. The Federal and State Governments should provide adequate instructional technology facilities such as computers, multimedia projectors, interactive whiteboards, internet services, and educational software to secondary schools.
2. School administrators should ensure that instructional technology resources are properly maintained and made readily available for classroom teaching and learning activities.
3. Teachers should receive regular training, workshops, seminars, and professional development programmes on the effective integration of instructional technology into classroom instruction.

4. The government and relevant educational stakeholders should improve electricity supply and internet connectivity in secondary schools to facilitate the effective use of digital learning technologies.
5. Schools should encourage teachers to adopt learner-centered instructional approaches that incorporate technological tools to enhance students' participation, creativity, critical thinking, and academic performance.

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