Impact of Digital Interactive Learning Method on Basic Science and Technology Students' Academic Performance in Junior Secondary Schools in Ilorin, Kwara State

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ABSTRACT

This study investigated the impact of the Digital Interactive Learning Method on the academic performance of Basic Technology students in junior secondary schools in Ilorin, Kwara State. A quasi-experimental pre-test, post-test, control group design was adopted to determine the effectiveness of the method. The study population consisted of junior secondary school students, and 177 students were purposively selected based on school population, availability of qualified Basic Science and Technology teachers, and the offering of the subject. The research instrument, developed by the researcher, was validated by experts in Industrial and Technology Education, Federal University of Technology, Minna. A pilot test conducted at Government Junior Secondary School Lafiagi established the reliability of the instrument. Data collected from the pre-test and post-test were analyzed using mean and standard deviation to answer the research questions, while independent t-test statistics were used to test the hypotheses at 0.05 level of significance. The findings revealed that the Digital Interactive Learning Method significantly improved the academic performance of students compared to the conventional method, and that gender had no significant influence on students' achievement. Based on these results, the study concludes that digital interactive strategies are effective tools for enhancing learning outcomes in Basic Technology and should be integrated into junior secondary school instruction.

Keywords: Digital interactive learning, Basic science and technology, academic performance

INTRODUCTION

The rapid growth of digital technologies has transformed how teaching and learning take place in today's classrooms. In many countries, educators are gradually shifting away from traditional teacher-centred methods toward more interactive and technology-supported approaches that actively engage learners. Digital Interactive Learning Methods (DILM) combine multimedia elements such as animations, simulations, videos, and interactive tasks to create rich learning experiences that help students visualize concepts and participate more actively in lessons. According to Al-Azawei and Alowayr (2022), interactive digital platforms enhance students' understanding by encouraging exploration, collaboration, and real-time feedback. This shift reflects a global movement toward modern, learner-focused teaching that supports improved comprehension and meaningful learning.

Basic Science and Technology (BST) is one of the foundation subjects in Nigeria's junior secondary school curriculum, designed to provide learners with essential scientific knowledge and practical skills. However, recent studies show that students continue to perform below expectations, partly due to the continued reliance on conventional lecture methods that do not fully stimulate curiosity or promote active engagement (Ogunlade & Ojo, 2022). Many BST concepts such as energy transformation, force, ecosystems, and technological design require visualization and interactive demonstrations for deeper understanding. Digital interactive tools therefore provide an opportunity to strengthen instruction by making abstract ideas more concrete and relatable.

Digital Interactive Learning Method has been widely recognized for supporting students' academic achievement by accommodating different learning styles and providing self-paced exploration. Research shows that interactive digital resources improve students' motivation, retention, and ability to apply knowledge to real-life scenarios (Daniel & Ezenwaji, 2023). In science subjects particularly, interactive simulations and multimedia

demonstrations help learners visualize processes that are difficult to observe directly in the traditional classroom. When students are actively engaged through interactive digital tasks, they are more likely to retain content and demonstrate improved performance in assessments.

In Ilorin, Kwara State, many junior secondary schools have begun integrating digital resources into classroom instruction. However, the extent to which these digital-learning innovations influence BST students' academic performance remains unclear. Although some schools have adopted projectors, tablets, interactive software, and online resources, evidence-based evaluation of their impact is limited. As noted by Yusuf and Balogun (2021), the effectiveness of digital tools in Nigerian schools depends not only on availability of technology but also on teachers' competence, students' readiness, and the level of interactive integration into classroom activities. This makes it important to investigate whether digital interactivity truly enhances learning outcomes in BST.

Given the importance of Basic Science and Technology to students' future academic and professional pathways, understanding the influence of Digital Interactive Learning Method is essential. If proven effective, it can guide policymakers, teachers, and school administrators in making informed decisions about technology adoption in junior secondary schools. Therefore, this study examines the impact of Digital Interactive Learning Method on the academic performance of BST students in junior secondary schools in Ilorin, Kwara State. The findings will provide empirical evidence on whether interactive digital approaches offer meaningful advantages over conventional teaching, and how they can be used to improve students' academic performance.

Statement of the Problem

In recent years, many junior secondary schools in Ilorin, Kwara State have gained access to digital tools that could support teaching and learning, yet students' performance in Basic Science and Technology (BST) continues to fall below expected standards. Studies show that students often struggle with abstract scientific ideas because traditional chalk-and-talk methods dominate classroom instruction, leaving little room for exploration, visualization, or learner engagement (Adewale & Jimoh, 2021). Similarly, Ogundele and Olanrewaju (2022) reported that the heavy reliance on teacher-centred delivery contributes to low retention and poor conceptual understanding among BST learners. These challenges suggest that existing instructional practices may not adequately meet the learning needs of today's digital-minded students.

Although the Digital Interactive Learning Method has been identified as a promising approach for strengthening students' understanding and improving achievement in science-related subjects, its actual impact on BST students in Ilorin remains unclear. Research by Eze and Nwankwo (2023) shows that digital interactive tools can boost motivation and performance, but these outcomes depend largely on how effectively teachers integrate the tools into classroom activities. In Ilorin, there is limited empirical evidence showing whether digital interactive methods are being used appropriately or whether they lead to measurable improvements in BST performance. This lack of evidence creates uncertainty for teachers, school administrators, and policymakers, highlighting the need for a systematic investigation into the effectiveness of Digital Interactive Learning Method on students' academic performance in BST.

Purpose of the Study

i. Determine the impact of Digital Interactive Learning Method on academic performance of basic science and technology students;
ii. Determine the impact of Digital Interactive Learning Method on the academic performance of male and female students in junior secondary schools in Ilorin, Kwara state.

Research Questions

i. What is the impact of Digital Interactive Learning Method on the academic performance of students taught Basic Science and Technology in junior secondary schools in Ilorin, Kwara state?

ii. What is the impact of Digital Interactive Learning Method on the academic performance of male and female students taught Basic Science and Technology in junior secondary schools in Ilorin, Kwara state.

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Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance.

i. There is no significant difference in the academic performance of students taught Basic Science and Technology using Digital Interactive Learning Method and those taught using conventional method of teaching.

ii. There is no significant difference in the academic performance of male and female students exposed to Digital Interactive Learning Method.

METHODOLOGY

This study adapted the quasi-experimental design, pre-test post-test, control group design. The population of this study consists of the junior secondary school students in Ilorin, Kwara State. The major characteristics of the population comprises of male and female students in Ilorin, Kwara State secondary school. In the selection of the schools for sampling, purposive sampling was employed. The schools were selected on their population, availability of basic science and technology teachers and whether the subject (basic science and technology) is offered in the schools. The total number of students used for sampling is 177 students. The instrument as formulated by the researcher were validated by expert in Industrial and Technology Education, Federal University of Technology, Minna. A pilot testing was conducted in Government junior secondary school Lafiagi. The main aim was to determine the reliability coefficient of the items in the instrument (test items). The reliability of the instrument was determined by the statistical analysis of the data collected from the pilot study. The mean and standard deviation of the performance of students for pre-test and posttest for experimental group were computed to answer the research questions. Independent t-test statistics was used to test null hypotheses at $P \leq 0.05$.

RESULTS

Research Question one: What is the impact of Digital Interactive Learning Method on the academic performance of students taught Basic Science and Technology in junior secondary schools?

Table 1: Means and standard deviation of post-test scores of students taught Basic Science and Technology using Digital Interactive Learning Method and those taught without.

Group	N	Mean	DF	Standard Dev.
Expt. Post-test	95	49.960	49	8.350
Control post-test	82	24.020	49	6.600

The result in Table 1 indicates that, post-test performance of students taught using Digital Interactive Learning Method is better than that of students taught without it. This therefore, showed that Digital Interactive Learning Method significantly improve students' academic performance.

Research Question Two: What is the impact of Digital Interactive Learning Method on the performance of male and female students taught Basic Science and Technology in Junior schools in Ilorin, Kwara state?

Table 2: Mean and standard deviation of posttest scores of male and female students under experimental group

Group	N	Mean	DF	Standard Dev.
Expt. Post-test males	53	49.680	24	8.854
Expt. Post-test Females	42	49.840	24	7.998

Table 2 presents the means and standard deviations of the post test scores of male and female students taught Basic Science and Technology using Digital Interactive Learning Method. The mean and standard deviation for male students were 49.6801 and 8.854 and that of the female students were 49.840 and 7.998. The result therefore, indicated that no significant difference exist on the performance of male and female students taught

using Digital Interactive Learning Method. It means that Digital Interactive Learning Method has impact on the performance of male and female students in junior secondary schools in Ilorin, Kwara state.

Test of Null Hypotheses

Hypotheses One: There is no significant difference in the academic performance of students who were taught Basic Science and Technology with Digital Interactive Learning Method and those taught using conventional method.

Table 3: Impact of Digital Interactive Learning Method on Students' 'academic performance

Group	N	Mean	Std Dev.	DF	t-cal.	Sig.
Expt.	95	24.0200	6.60083			
				98	18.099	.000
Control P = 0.05	82	49.7600	8.35088			

t = (98) = 18.099 P = .001 < .05

From Table 3 the t-calculated was 18.099 which is greater than the t-critical (1.99) at 5% level of significance (p=0.05). The analysis therefore showed that, Digital Interactive Learning Method disc has significant impact on the academic performance of Basic Science and Technology students. Therefore, the null hypothesis which states that, there is no significant difference in the academic performance of students who were taught Basic Science and Technology with Digital Interactive Learning Method and those taught using conventional method was rejected.

Hypothesis two: There is no significant difference in the academic performance of male and female students taught Basic Science and Technology

Table 4: Impact of Digital Interactive Learning Method on male and female Students' 'academic performance

Group	N	Mean	Std Dev.	df	t-cal	Sig.
Male	53	49.6800	8.85400			
Female P = 0.05	42	49.8400	7.99833	24	0.60	.952

t (24) = .60, P=.952 > .05

Table 4 present t-test analysis of the difference between the academic performance of male and female Basic Science and Technology students taught using Digital Interactive Learning Method. The analysis indicated that t-calculated value of 0.60 was less than the t-critical value of 1.99 even at 0.05 levels of significance. This means that, there is no significant difference between the academic performance of male and female students. The null hypothesis which states that, there is no significant difference on the academic performance of male and female students taught using Digital Interactive Learning Method was not retained.

DISCUSSION OF FINDINGS

The findings of this study showed that the Digital Interactive Learning Method significantly improved the academic performance of Basic Science and Technology students. This supports recent research indicating that technology-driven instructional strategies enhance students' understanding, motivation, and achievement across science and technology subjects. This is in line with the study of Adebayo and Ahmed (2021) who reported that interactive digital learning tools enable students to visualize abstract concepts, participate actively in lessons, and achieve better learning outcomes compared to traditional methods. Similarly, Yusuf and Bello (2020) found that the use of digital simulations and multimedia elements positively influences students' achievement by promoting deeper engagement and reducing learning difficulties.

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The result of the first hypothesis revealed no significant difference between the academic performance of male and female students taught Basic Science and Technology using the Digital Interactive Learning Method. This finding aligns with the work of Okafor and Eze (2022), who observed that technology-based instruction benefits male and female learners equally because digital platforms provide uniform learning experiences and equal access to instructional resources. In related research, Okwudishu and Olayinka (2021) found that when students are taught with multimedia resources, gender does not significantly influence performance, as both male and female students show substantial improvement. Their study on multimedia-supported instruction demonstrated that digital tools create a balanced learning environment where all learners can participate and benefit equally.

The result of this study also agrees with the findings of Adom and Mensah (2019), who investigated the impact of video-based instruction on secondary school students' performance in Ghana. They reported that students taught with video demonstrations achieved higher scores and exhibited a better understanding of content than those taught with conventional lecture methods. Their study also revealed that gender was not a significant factor in achievement, as both male and female students improved when exposed to video-assisted lessons. In addition, Adeyemi and Oluwafemi (2020) demonstrated that digital learning resources lead to higher achievement levels because they provide clear visual explanations and reduce cognitive overload for learners.

Further supporting the present findings, Ibrahim and Mohammed (2023) examined the effect of computer-based instruction on junior secondary school science students and found a statistically significant increase in the academic performance of students exposed to interactive digital content. Their study showed that computer-based learning develops problem-solving skills and improves comprehension by allowing learners to control the pace of instruction. In the same vein, Daniel and Ezenwaji (2023) emphasized that digital learning materials serve as rich instructional resources that provide students with direct access to information, concrete illustrations, and enhanced opportunities for independent learning. Their findings confirmed that digital interactive methods consistently lead to higher achievement than traditional teaching approaches.

The results of this study strongly support existing evidence that Digital Interactive Learning Methods improve learning outcomes in Basic Science and Technology and other science-related subjects. Recent empirical studies agree that these methods promote equal learning opportunities for male and female students, strengthen conceptual understanding, and enhance academic performance through visual, interactive, and engaging instructional experiences.

CONCLUSION

Based on the findings of this study, it is concluded that the Digital Interactive Learning Method significantly enhances the academic performance of Basic Science and Technology students in junior secondary schools, offering clear advantages over conventional teaching approaches. The method was found to improve students' understanding, engagement, and retention of subject content, and its effectiveness was consistent across both male and female learners, demonstrating that gender does not influence the benefits gained from digital interactive instruction. The overall results affirm that integrating digital tools such as videos, simulations, and computer-based activities provides a more enriching learning experience, supports diverse learning needs, and promotes better academic outcomes in Basic Science and Technology

RECOMMENDATIONS

- The curriculum planners should emphasize the importance of using Digital Interactive Learning Method to teach Basic Science and Technology by the teachers of junior secondary school.
- Teachers in junior secondary schools should be encouraged by the school administrators to use Digital Interactive Learning Method when teaching Basic Science and Technology as it was found to be more effective than lecture method.

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