Effects of Web-Based Instructions on Junior Secondary School Students' Academic Performance in Selected Basic Technology Concepts in Nigeria

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ABSTRACT

Nigeria's Basic Technology (BT) education is crucial for preparing students for a technology-driven society. However, conventional methods consistently limit students' effective engagement with technology, especially with available innovative technological strategies, which can also be used to enhance students' learning and performance. Therefore, this study examined effects of web-based instructions on Junior Secondary School (JSS) students' academic performance in selected Basic Technology (BT) concepts in Nigeria. Objectives of the study: (i) examined differences between the mean scores of JSS students taught BT using wizer.me and conventional method; and (ii) examined differences between the mean scores of JSS students taught BT using Quizizz and conventional method. The study adopted quasi experimental design. The population comprised all JSS 2 students in Nigeria, and target population involved JSS students in three south-west schools. Intact class of 115 JSS II students were purposively selected for the study. Validated Wizer.me, Quizizz, BT performance Test, and researcher-designed questionnaire were used for data collection. Data collected were analyzed using descriptive and inferential statistics at 0.05 significant level.

Findings of the study showed:

there was a significant difference in the mean scores of JSS students taught BT using Wizer.me and the Conventional method (F-value =0.00, $p<0.05$);

there was a significant difference in the mean scores of JSS students taught BT using Quizizz and the Conventional method (F-value =296.50, $p<0.05$).

The study concluded that Wizer.me and Quizizz were effective for improving students' performance in BT and recommended integrating both web-based tools into the JSS BT curriculum.

Keywords: Web-Based Instruction, Wizer.me, Quizizz, Conventional Method, Basic Technology, Academic Performance.

INTRODUCTION/LITERATURE REVIEW

In Nigeria, most Junior Secondary Schools primarily use the conventional lecture method, which involves teacher's verbal presentation of instructional contents while students listen and take notes. Commonly referred to as the "talk and chalk" instructional method, which has for long dominated the instructional landscape in Nigerian schools. However, to adequately engage students in a technology driven subject like basic technology,

then, there has to be an intentional paradigm shift in instructional approach and resources. For which many Nigerian schools cannot proudly say, except for a few schools equipped with computer laboratories and ICT resources. These schools also require internet connectivity, enabling students' access to online learning resources (Olukayode, Oriola, & Ajao 2022). This is because, the internet also complements classroom instruction by ensuring access to online resources, enabling long-distance study opportunities, and multimedia communication for subjects like basic technology among other opportunities.

Specifically, basic technology is a core subject in upper basic schools in Nigeria that integrates various vocational disciplines such as woodwork, metalwork, building technology, automotive mechanics, electrical electronics, and technical drawing. According to the National Policy on Education, (FRN, 2013), the primary objectives of teaching Basic Technology are to provide students with pre-vocational orientation for further technological training, foster basic technology literacy for everyday life, and stimulate creativity and innovation. To achieve these goals, the right teaching methods must be applied, in other for students to acquire the necessary technological knowledge and skills required to flourish in a technologically driven society (Elom & Ogwa, 2017).

In view of this, two notable web-based instructional (WBI) platforms Wizer.me and Quizizz have been identified to offer innovative and engaging technological ways to facilitate learning where students often struggle with subjects like Basic Technology due to the abstract nature of teaching methods that does not expose students to flexible learning experiences. Wizer.me is a web-based learning platform that offers learning support by making teaching and learning more interesting. Specifically, Wizer.me is a digital worksheet creation tool that teachers can use to build educational content as well as assign specific tasks, including having students label images or respond to multiple choice questions, and allows for the inclusion of questions, images, videos, and recording instructions (Edwards, 2021).

Quizizz is also a web-based platform that offers engaging and interactive lessons to help students learn on any device by presenting the choice of where, when, and how to learn. Zhao (2019) explained that Quizizz is a free and easy-to-use web-based learning platform that teachers may use to create lessons, conduct formative assessments, assign homework, and engage in other students interactions. It also has gamification elements, along with interactive learning materials such as leaderboards, live videos, live chat, and more. Which makes it creative, innovative, challenging, entertaining, and flexible for students' to learn. By implication, the use of digital worksheets created by Wizer.me and Quizizz can facilitate the basic technology learning process in Junior Secondary Schools across Nigeria which may result in improved student engagement and academic performance.

That said, empirical studies have revealed that WBI significantly improves students' academic performance compared to conventional methods. According to Moses, Akporehwe, and Agah, (2020), students in a WBI group performed better than those in conventional method group. Similarly, Abd-El-Aziz and Hassan, (2017) study revealed that WBI was more effective in helping students improve their academic performance than the conventional method. Alo and Origines, (2021) study also showed that WBI was more effective in improving the academic performance of Grade 7 students in science.

In contrast, Darkwa and Antwi, (2021) compared WBI with conventional method, findings of the study showed that the conventional method was more effective than a WBI. Also, Okeke and Osuagwu, (2012) posited that students who learn using conventional method performed marginally better than students who learn using WBI. Also, Wagner, Garippo, and Lovaas, (2011), and Stack, (2015) studies revealed no significant difference in students' performance based on WBI and conventional instruction. However, despite so much that have been revealed, it is important for both teachers and students to keep exploring the flexibility of WBI for instructional good, hence, the investigation of this study.

Statement of the Problem

Basic Technology education in Nigeria plays a crucial role in equipping students with the necessary knowledge and skills to navigate the increasingly technology-driven world. In spite of the pool of opportunities provided with technological tools and packages available on the web, junior secondary school students are still been

exposed to conventional instructional methods in basic technology. However, the researchers observed that the conventional methods often fall short in engaging students, facilitating deep learning, and enhancing performance. As a result, the researchers observed the need to explore the use of innovative and technology driven approach that can motivate, engage, and enhance students' performance in basic technology, and as well enhance students' understanding of concepts in basic technology, as established by the Federal Government of Nigeria, National Policy on Education (FRN, 2013).

In view of this, Web-based platforms like wizer.me and Quizizz have gained popularity among educators as the technological tools that offer the kind of alternative approach to teaching-learning process that can enhance students' comprehension of concepts in basic technology. However, while these web based tools provide interactive and engaging learning experiences, it remains unclear whether they effectively improve students' academic performance in basic technology. Hence, the lacuna this study aims to fill by examining the effects of web-based instructions on Junior Secondary School students' academic performance in selected basic technology concepts in Nigeria.

Purpose of the Study

The main purpose of this study was to investigate the effects of web-based instructions on Junior Secondary School students' academic performance in selected basic technology concepts in Nigeria. Specifically, the study:

examined difference between the mean scores of junior secondary school students taught Basic Technology using Wizer.me and the conventional method;

examined difference between the mean scores of junior secondary school students taught Basic Technology using Quizizz and the conventional method

Research Questions

The following research questions were answered in the study:

What was the difference between the mean scores of junior secondary school students taught Basic Technology using Wizer.me and the conventional method?

What was the difference between the mean scores of junior secondary school students taught Basic Technology using Quizizz and the conventional method?

Research Hypotheses

The following null hypotheses were tested at a 0.05 significance level in the study:

Ho_1: There was no significant difference in the mean scores of junior secondary school students taught Basic Technology using Wizer.me and the conventional method.

Ho_2: There was no significant difference in the mean scores of students in junior secondary school students taught Basic Technology using Quizizz and the conventional method.

METHODOLOGY

The study used a quantitative approach, specifically a quasi-experimental non-randomized and non-equivalent control group design. The design is appropriate for the study because random assignment of participants to groups was not possible. The population for this study comprised all junior secondary school (J.S.S.) students in Nigeria, with the target population being J.S.S. two students from schools in South-West, Nigeria. Purposive sampling technique was used to select three junior secondary schools in Osun and Oyo states based on the

availability of well-equipped, accessible, and functioning computer laboratories with Internet service to engage the students in a web-based instruction in basic technology.

School A and B were used for the experimental group while school C was used for the control group. A total of 115 students in an intact class were involved in the study. Three research instruments were used in the study: adapted wizer.me, adapted quizizz, and adopted Basic Technology Performance Test (BTPT). Data collected were analyzed using both descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions. Analyses of Covariance (ANCOVA) was used to test the study two hypotheses at significant level of 0.05, using Statistical Package for Social Sciences (SPSS) version 23.0 for the study analyses.

RESULTS

Table 1: Selection of Participants Based on Experimental and Control Groups

Group	Frequency	Percentage%
Experimental Group I (Wizer.me)	45	39.10
Experimental Group II (Quizizz)	41	35.60
Control Group	19	16.52
Total	**115**	**100.00**

Table 1 shows the distribution of the participants in three groups: Experimental Group I (using Wizer.me) with 45 participants (39.10%), Experimental Group II (using Quizizz) with 41 participants (35.60%), and the Control Group with 19 participants (16.52%), making the total sample size 115 participants. This distribution shows that a significant majority of the participants participated in the experimental group, using either Wizer.me or Quizizz, which together represent 74.70% of the sample.

Research Question 1: What was the difference between the mean scores of Junior Secondary School students taught Basic Technology using Wizer.me and conventional method?

Table 2: Difference between the mean scores of Junior Secondary School Students taught Basic Technology using Wizer.me and Conventional Method

Source of Variation	N	Pre-test Mean	Post-test Mean	Gained Mean	Remark
Experimental Group I (Wizer.me)	45	4.76	9.10	4.34	
Control Group	19	1.78	4.45	2.67	

Table 2 shows difference in the mean scores of J.S.S. students taught Basic Technology using Wizer.me compared to the conventional method. The experimental group using Wizer.me had a higher pre-test mean score (4.76) compared to the control group (1.78). Post-test mean score of the experimental group increased to 9.10, resulting in a gain mean of 4.34. While, the mean score for the control group rose to 4.45, with a gained mean of 2.67. This showed that Wizer.me was more effective in improving students' performance in basic technology compared to the use of conventional method.

Research Questions 2: What was the difference between the mean scores of junior secondary school students taught Basic Technology using Quizizz and the conventional method?

Table 3: Difference between Mean Scores of Junior Secondary School Students Taught Basic Technology using Quizizz and Conventional Method

Source a of a Variation	N	Pretest Mean	Posttest Mean	Gained Mean	Remark
Experimental Group II (Quizizz)	41	3.21	6.80	3.59	
Control Group	19	1.78	2.45	0.98	Effective

Table 3 shows difference in the mean scores of junior secondary school students taught basic technology using Quizizz compared to the conventional method. The experimental group using Quizizz had a higher pre-test mean score (3.21) compared to the control group (1.78). Post-test mean scores of the experimental group increased to

6.80, resulting in a gain mean of 3.59. While, the mean score for the control group rose to 2.45, with a gained mean of 0.98. This indicated that Quizizz was more effective in improving students' performance in basic technology compared to the use of conventional method.

Research Hypothesis One: There was no significant difference in the mean scores of junior secondary school students taught Basic Technology using Wizer.me and the conventional method.

Table 4: ANCOVA Analysis on the Difference in the Mean scores of Junior Secondary School Students taught Basic Technology Using Wizer.me and the Conventional Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	.435[a]	2	109	.672	.02
Intercept	1703.92	1	1703.92	10531.87	.00
Pre-test	.435	2	.109	.672	.02
Error	150.94	62	.1.62		
Total	9694.09	64			
Corrected Total	151.38	64			
R Squared = .003 (Adjusted R Squared = -.001) Significance level: 0.05					

Table 4 is the result of the hypothesis tested in the study using ANCOVA. The results showed that the corrected model had a p-value of 0.02, which is below the significance level, suggesting statistically significant difference in performance between the groups. Additionally, pre-test scores significantly influenced post-test scores. Therefore, the null hypothesis; there is no significant difference in the mean performance score of Junior Secondary School students taught Basic Technology through wizer.me and the conventional method was rejected. Therefore, there was a significant difference in the mean scores of Junior Secondary School students taught Basic Technology using wizer.me and the conventional method

Research Hypothesis Two: There was no significant difference in the mean scores of junior secondary school students taught Basic Technology using Quizizz and the conventional method.

Table 5: ANCOVA Analysis on the Difference in the Mean scores of Junior Secondary School Students taught Basic Technology Using Quizizz and the Conventional Method

Source	Type III Sum of Squares	Df	Mean Square	F-value	P-value
Corrected Model	626.595	2	35341.227	472.81	.061
Intercept	1734.170	1	17242.160	296.50	.00
Pretest	5211.486	2	17242.161	178.442	.00
Error	4260.195	58	42.564		
Total	4984.000	59			
Corrected Total	6215.790	60			

Table 5 shows results of the hypothesis tested in the study using ANCOVA. The corrected model had a p-value of 0.061, which is above the 0.05 significance level, indicating that there was no statistically significant difference in performance between the experimental group and the control group. The intercept was also not significant, with a p-value of 0.00, suggesting that the overall mean performance scores differs significantly. Furthermore, the pre-test scores, considered as covariates, had a p-value of 0.00, indicating a significant influence in the post-test scores. Therefore, the null hypothesis that; there was no significant difference in the mean scores of Junior Secondary School students taught Basic Technology using Quizizz and the conventional method was rejected. Therefore, there was a significant difference in the performance of students taught Basic Technology using Quizizz and the conventional method.

DISCUSSIONS

This study investigated the effects of web-based instructions on Junior Secondary School students' academic performance in selected basic technology concepts in Nigeria. Two experimental groups (using wizer.me and

quizizz), and a control group using the conventional method were involved in the study. Findings of the study showed that web-based instruction using wizer.me and quizizz were more effective in enhancing students' academic performance in basic technology than the conventional method. The findings aligns with the study of Osipova and Bagrova, (2023) which affirmed that Wizer.me offers a user-friendly interface that is easy to navigate, making it accessible for both teachers and students, and subsequently improving students' performance. Similarly, the findings also aligns with Dewi, et.al. (2020) which indicated that students taught with quizizz web-based application performed better than students taught using conventional method.

Furthermore, findings of this study is also consistent with study of Moses, et.al. (2020) which revealed that students taught using web-based instruction (WBI) performed better than students taught using conventional method. Similarly, Abd-El-Aziz and Hassan, (2017) also revealed that WBI was more effective in improving JSS students' academic performance in Basic Science and technology, than the conventional method. Also, the study is in agreement with Alo and Origines, (2021) on the effectiveness of WBI in enhancing the academic performance of grade 7 science students, the result showed that WBI was more effective than the conventional method.

In contrast, Darkwa and Antwi, (2021) compared WBI with conventional method of instruction, findings of the study showed that the conventional method is more effective than WBI. Also, Okeke and Osuagwu, (2012) posited that students who learnt using conventional method performed marginally better than the students who learnt using WBI. Wagner, et.al. (2011) and Stack, (2015) also revealed no significant difference in students' performance between the two modes of instruction. The study revealed that the delivery method of WBI or conventional classroom had no significant effect on the performance of students. Which validates the notion that while technology enhances educational experiences, it does not automatically translate to students performing better academically or that students cannot perform equally better using conventional method across all subjects or contexts.

CONCLUSION

The study concluded that both Wizer.me and Quizizz were effective web-based instructional tools for improving students' performance and understanding of concepts in Basic Technology than the conventional method. Both Wizer.me and Quizizz groups significantly performed better than the conventional method group. Which showed that the web-based instructional applications have strong potential to enhance learning outcomes than the conventional method. The results further suggest that the integration of interactive platforms like Wizer.me and Quizizz in Basic Technology instruction can be beneficial for diverse students' population, promoting engagement and academic success in a web-based learning situation.

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