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Effect of Virtual Learning Strategy on Students' Interest in Difficult Concepts in Basic Science and Technology in Basic Education Schools in Benue State, Nigeria

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Abstract

This study investigated the effect of virtual learning strategy on students' interest in difficult concepts in Basic Science and Technology in basic education schools in Benue State, Nigeria. The study was guided by two specific objectives. Two research questions were asked and answered by the study. Two hypotheses were formulated and tested at 0.05 level of significance. The study adopted quasi-experimental research design. The population of the study was 23,994 students and the sample size was 239 students. The study used one instrument, the Basic Science and Technology Interest Rating Scale (BSTIRS). The instrument was validated by five experts. Reliability coefficient of 0.67 was obtained for the interest rating using Cronbach Alpha formula. The data obtained from the study were analyzed using mean and standard deviation to answer the research questions while

ANCOVA; was used to test the hypotheses at 0.05 level of significance. The findings revealed that students taught Basic Science and Technology using virtual learning strategy have more interest than students taught using the conventional classroom method and male students taught Basic Science and Technology using virtual learning strategy have more interest than their female counterpart. However, the difference in their interest level is not significant. Based on the findings, the study concluded that virtual learning strategy is an effective strategy for teaching Basic Science and Technology as it helps to increase students' interest in Basic Science and Technology. The study recommended that Virtual learning strategy is an effective strategy in teaching Basic Science and Technology as it promotes students' interest and therefore should be implemented by the teachers of Basic Science and Technology at all levels of Basic education.

Keywords: Basic Education, Basic Science and Technology, Difficult Concepts, Virtual Learning Strategy, Teaching Methods, Interest

Introduction

The education sector is seen as one of the most important sectors in every economy in the world. It has been the backbone of all meaningful developments of every nation all over the world. Advancement in science and technology has recently changed the educational systems in society with the introduction and use of computer software packages for classroom instructional purposes. Bharathy (2015) stated that the use of computers in the learning process brings a major paradigm shift in education that promises advantages over lecture learning system. The potential benefits of computers cannot be overemphasized as they give students a sense of empowerment and enable them to control the pace and repeat the lessons when they feel the need to do so.

Science and its applications are part of the daily activities that make life better and understandable. Science has been regarded as the bedrock upon which the modern-day technological breakthrough is built upon. Science has been a major tool for technological growth in all aspects of human life. The National Policy on Education (FRN, 2014), identified the goal of science education to include, building of national unity, inculcation of national consciousness, training the mind to understand the world around us, acquisition of appropriate skills, development of mental, physical and social abilities of the citizens to contribute to national development. Musa *et al.* (2021) stated that science is a subject that is difficult to understand. One of the causes of science subjects (Basic Science and Technology in particular) experiencing difficulty for students is the lack of learning media that can provide illustrative images of real phenomena, so that students seem to have difficulty understanding the material without media availability (Awal, 2015). Efforts to solve this problem therefore led to the introduction of Basic Science and Technology in the Basic Education Schools (Primary and Junior Secondary Schools).

Basic Science and Technology is a combination of the former Integrated Science and Introductory Technology which a child encounters at the Upper Basic level of education. It is a composite form of science at Upper Basic level of education involving concepts from Chemistry, Physics, Biology, Technology, Physical and Health Education, and Geography. It prepares students at the Upper Basic level for subsequent study of specialized core science courses (Enemarie, Ogbaba & Ajayi, 2019). The goals of Basic

Science and Technology according to Nigerian Educational Research and Development Council (NERDC) (2012) are to develop learners' interest in science and technology; acquire basic knowledge and skills in the subject; apply basic scientific and technological knowledge and skills to meet contemporary societal needs, among others. Also, the Federal Republic of Nigeria (FRN, 2013), in release of her educational objectives for secondary schools, emphasizes the need to equip students to live effectively in the modern age of science and technology. Basic science and technology being a unique approach to science education has some concepts which are in themselves difficult for students to understand, (Achor & Agbidye, 2014). Ncharam in Achor and Agbidye, (2014) established that students' inability to comprehend difficult concepts in Basic Science and Technology results in poor achievement of the students at the Junior Secondary School Certificate Examination (JSSCE) and general backwardness in scientific and technological advancement and lack of interest in students.

Interest has been found to be a very powerful motivational process that energizes learning and is essential to academic success. Interest of a student in any subject is an energizer for a meaningful learning to take place (Abakpa, 2011). Interest is seen as that quality which arouses curiosity, and as such hold a student attention to a learning activity. When a student develops interest in a particular subject, the student will definitely derive satisfaction from the knowledge of the subject as he/she studies the said subject. The changing complexities in technology in the 21st-century, has caused students to lose interest in traditional teaching and learning methods. To keep students engaged, instructional programs and teaching techniques require creative methods (Zaidi *et al.*, 2018). This includes the adoption of new forms of lesson delivery to make learning more engaging, increase the interest rate and enhance the comprehension of the content taught (Gulley & Jackson, 2016). Researchers have recently shown a growing interest in the use of YouTube videos in teaching and learning inform of virtual learning. This can help to improve the student's achievement in the subject. Lawal (2017) revealed that student's poor achievement and lack of interest in science secondary schools (Basic Science and Technology in particular) is connected to a number of factors, either the instruction strategy employed or differences in their gender.

Gender imbalance is conceived as the structural relationship of inequality between males and females as manifested in education. Gender inequality in education has remained a perennial problem of global scope (UNESCO, 2021). Nworgu in Achor and Agbidye (2014), revealed that there exist gender differences in science achievement in our schools. They discovered that male students performed significantly better than female students but this may not be the case all the times. Adeniran (2013) noted that female students perceive science as a very demanding course which requires high intelligence and critical thinking. He suggested that gender stereotypes in classroom can be broken by adopting a teaching strategy that gives equal opportunities to both boys and girls. According to Bichi (2012) students tends to develop high interest if the right teaching strategy is employed. This teaching strategy could be virtual Learning. It is therefore necessary for this study to check the effects of virtual learning on the students' interest in Basic Science and Technology.

Virtual learning has gained significant attention in recent years as technology continues to advance and shape the landscape of education. Traditionally, classroom instruction has been the primary mode of delivering Basic Science and Technology education. However, with the rapid expansion in internet access and availability of digital tools and platforms, virtual learning has emerged as a potential solution to address the challenges faced by students in understanding difficult concepts. Therefore, because of the different ways that students learn, diversity is needed in the teachers' teaching strategy. To keep students engaged, instructional programs and teaching techniques require creative methods (Zaidi *et al.*, 2018). This includes the adoption of new forms of lesson delivery to make learning more engaging, increase interest and enhance the comprehension of the content taught as well as high achievement (Gulley & Jackson, 2016). It is on this note that this study seeks to ascertain the Effect of Virtual Learning Strategy on Students' Interest in Difficult Concepts in Basic Science and Technology in Basic Education Schools in Benue State, Nigeria.

Research Objectives

The main objective of this study is to determine the effect of virtual learning strategy on students' interest in difficult concepts in Basic Science and Technology in Basic Education schools in Benue State, Nigeria.

Specifically, the study determined:

- i. The mean interest rating of students taught difficult concepts in Basic Science and Technology using virtual learning strategy and those taught using conventional classroom.
- ii. The mean interest rating of male and female students taught difficult concepts in Basic Science and Technology using virtual learning strategy;

Research Questions

The following research questions were asked and answered by the study;

- i. What is the mean interest rating of students taught difficult concepts in Basic Science and Technology using virtual learning strategy and those taught using conventional classroom?
- ii. What is the mean interest rating of male and female students taught difficult concepts in Basic Science and Technology using virtual learning strategy?

Research Hypotheses

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

- i. There is no significance difference in the mean interest ratings of students taught difficult concepts in Basic Science and Technology using virtual learning strategy and those taught using conventional classroom.
- ii. There is no significance difference in the mean interest ratings of male and female students taught difficult concepts in Basic Science and Technology using virtual learning strategy.

Methodology

The study adopted a quasi-experimental research design. The study area is Benue State, Nigeria. The population of the study is 23,994 (12,233 males and 11,761 females) Basic 8 (Upper Basic II) students in UBE schools in Benue State. The sample size for the study was 239 Basic 8 (Upper Basic II). The experimental group has 116 students (53 Males and 63 Females) and the control group has 123 students (54 males and 69 Females). The sampling techniques was multistage sampling. Purposive sampling techniques was used in selecting of the schools for the study in the three educational zones in the State on the basis that the school must be a UBE school, and it must be co-educational (male and female) because gender is a moderating factor in the study. Random sampling was used to select the schools to assign to the experimental group and control group.

The instrument for data collection was Basic Science and Technology Interest Rating Scale, consisted of 20 items constructed on a 4-point rating scale of Strongly Agree (SA=4 points), Agree (A=3 points), Disagree (D=2 points) and Strongly Disagree (SD=1 point). However, there are a few negatively worded items which are rated in the scale of Strongly Agree (SA=1 points), Agree (A=2 points), Disagree (D=3 points) and Strongly Disagree (SD=4 point).

The instrument was administered at the beginning of the exercise as pretest to determine the students' level of interest. Lesson was carried out in accordance with the lesson plan for both experimental and control groups respectively. The research questions were answered using descriptive statistic of mean and standard deviation. Inferential statistical tool of ANCOVA was used to test the research hypotheses at 0.05 level of significance.

Results

This section presents the results and discussion of findings of the study.

Research Question One

What is the mean interest rating of students taught difficult concepts in Basic Science and Technology using virtual learning strategy and those taught using conventional classroom?

Table 1: Mean and Standard Deviation of the Interest Rating of Students Taught Basic Science and Technology Using Virtual Learning Strategy and those Taught Using the Conventional Method

Groups	Pre-Interest			Post-Interest		
	N	Mean	Std Dev	Mean	Std Dev	Main Gain
Experimental	116	3.03	0.31	3.53	0.12	0.50
Control	123	3.02	0.33	3.22	0.24	0.20
Mean Difference		0.01		0.31		0.30

The results presented in Table 1, shows that the mean interest score of students taught Basic Science and Technology using virtual learning strategy was 3.03 for pre-test and 3.53 for the post-test with corresponding standard deviation of 0.31 and 0.12 respectively. However, the mean interest score of students taught Basic Science and Technology with the conventional classroom method was 3.02 for the pre-test and 3.22 for the post-test, with standard deviation of 0.33 and 0.24 respectively. The mean gain for the experimental group is 0.50 while the control group is 0.20. The group mean difference was 0.01 for pre-test and 0.31 for post-test while the interest mean gain is 0.30 in favor of the experimental group.

Research Question Two

What is the mean interest rating of male and female students taught difficult concepts in Basic Science and Technology using virtual learning strategy?

Table 2: Mean and Standard Deviation of the Interest Rating of Male and Female Students taught Difficult Concept in Basic Science and Technology Using Virtual Learning Strategy

Groups	Pre-Interest			Post-Interest		
	N	Mean	Std Dev	Mean	Std Dev	Main Gain
Male	53	3.00	0.32	3.57	0.13	0.57
Female	63	3.05	0.30	3.50	0.10	0.50
Mean Difference		0.05		0.07		0.07

The results presented in Table 2, shows that the mean interest score of male students taught Basic Science and Technology using virtual learning strategy was 3.00 for pre-test and 3.57 for the post-test with corresponding standard deviation of 0.32 and 0.13 respectively. However, the mean interest score of female students taught Basic Science and Technology with using virtual learning strategy was 3.05 for the pre-test and 3.50 for the post-test, with standard deviation of 0.30 and 0.10 respectively. The mean gain for the male students is 0.57 while the female students have a mean gain of 0.50. The group mean difference was 0.05 for pre-interest and 0.07 for post-interest while the interest mean gain is 0.07 in favor of the male students.

Research Hypothesis One

There is no significance difference in the mean interest ratings of students taught difficult concepts in Basic Science and Technology using virtual learning strategy and those taught using conventional classroom.

Table 3: Summary of ANCOVA Result of Students' Interest on Experimental and Control Groups.

Source	Type Sum Squares	III of	df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	6.536 ^a		2	3.268	102.181	.000	.468	
Intercept	20.510		1	20.510	641.280	.000	.734	
Pretest	.829		1	.829	25.932	.000	.101	
Group	5.656		1	5.656	176.843	.000	.433	
Error	7.420		236	.032				
Total	2683.771		239					
Corrected Total	13.956		238					

a. R Squared = .468 (Adjusted R Squared = .464)

The result of the Analysis of Covariance presented in Table 3 shows that the p-value of 0.000 is less than the 0.05 level of significance. This shows that the test is significant. The result implies that there is a statistically significant difference between the mean interest rating of students taught Basic Science and Technology with virtual learning strategy and those taught using the conventional teaching method. This means that students who were exposed to virtual learning strategy showed higher level of interest in learning Basic Science and Technology than those in the conventional. Therefore, the null hypothesis of no significant difference is rejected.

Research Hypothesis Two

There is no significance difference in the mean interest ratings of male and female students taught difficult concepts in Basic Science and Technology using virtual learning strategy.

Table 4: Summary of ANCOVA Result of Mean Interest Rating of Male and Female Students Taught Difficult Concepts in Basic Science and Technology Using Virtual Learning Strategy

Source	Type Sum Squares	III of	df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	.347 ^a		2	.173	1.786	.173	.031	
Intercept	.246		1	.246	2.537	.114	.023	
Posttest	.283		1	.283	2.918	.090	.026	
Gender	.153		1	.153	1.578	.212	.014	
Error	10.674		113	.097				
Total	1045.495		116					
Corrected Total	11.021		115					

a. R Squared = .031 (Adjusted R Squared = .014)

The result of the Analysis of Covariance presented in table 4 shows that the P-value of 0.212 is greater than the 0.05 level of significance. This shows that the test is not significant. The result implies that there is no statistically significant difference between the mean interest rating of male and female students taught Basic Science and Technology using virtual learning strategy. This means that the male and female students exposed to virtual learning strategy shows the same level of interest in Basic Science and Technology. Therefore, the null hypothesis of no significant difference is not rejected.

Summary of Major Findings

Based on the analysis of data from the study, the following findings were made:

- i. Students taught Basic Science and Technology using virtual learning strategy have more interest than students taught using the conventional classroom method.
- ii. Male students taught Basic Science and Technology using virtual learning strategy have more interest than their female counterpart. However, the difference in their interest level is not significant.

Discussion

The finding of this study based on research question one and hypothesis one revealed that students taught difficult concepts in Basic Science and Technology using virtual learning strategy have higher interest than students taught using the conventional classroom method. The finding revealed that the difference in their interest level was statistically significant. The finding of this study agrees with the finding of Omiola, Ibrahim and Gidado (2022), who

found that respondents preferred virtual activities and learning resources because it increases students' interest in the subject. The study agrees with the findings of Sambo *et al.*, (2020), who found that there was significant difference between performance and skill acquisition scores, which in turn increase their interest. Also, the findings of the study agree with the findings of Akaa (2023), who found that students taught Agricultural Science using Google Classroom had more interest than those taught with the conventional classroom method.

Findings from research question two and hypothesis two revealed that Male students taught difficult concepts in Basic Science and Technology using virtual learning strategy have more interest than their female counterpart. However, the findings also revealed that the difference in their interest level is not significant. The findings of the study agree with the findings of Omiola, Ibrahim, & Gidado, (2022), who found no significant difference in the preference of virtual learning in addressing the issue of large class based on gender. The findings of the study negate the findings of Akaa (2023), who found that female students taught Agricultural Science using Google Classroom showed more interest than their male counterparts.

Conclusion

Based on the findings, the study deduced that the method used in teaching Basic Science and Technology has significant effect on the students' interest. The study therefore concludes that virtual learning strategy is an effective strategy for teaching Basic Science and Technology as it helps to increase students' interest in Basic Science and Technology as well as promote gender parity in learning.

Recommendations

Based on the findings of the study, it was recommended that Virtual Learning Strategy is an effective strategy in teaching Basic Science and Technology as it promotes students' interest and therefore should be implemented for the teachers of Basic Science and Technology at all levels of Basic education.

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