

EFFECT OF USING WEB-BASED ON STUDENTS' ACHIEVEMENT AND RETENTION IN BASIC TECHNOLOGY IN NIGER STATE, NIGERIA

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ABSTRACT

This study compared the effect of using web-based instructional package on students' achievement and retention in basic technology. The purpose of the study was to ascertain the mode of web-based usage that is more effective in enhancing students' achievement and retention in basic technology. This study was carried out in Minna, Niger State was purposively chosen because of the availability of computers in schools. A sample of one hundred and two (102) JSSII students was involved in the study. The design of this study was quasi-experimental research design as there was no randomization of subjects into classes. Intact classes were used. Four research questions and four research hypotheses guided the study. Research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used in testing the hypotheses at 0.05 level of significant. Results from the study revealed that students who were taught basic technology using web-based computer achieved and retained higher than those taught without web-based. Also students who were taught basic technology using web-based as tool achieved and retained higher than those taught with web-based as tutor. The study equally revealed no significant difference in the mean achievement and retention scores of male and female students. Some of the recommendations made include; that teachers should pay more attention to using computer as tool instead of using it as tutor for effective teaching and learning of basic technology.

Keywords: web-based, students, basic technology, achievement, retention

INTRODUCTION

Junior Secondary School education is both pre-vocational and academic, universal and compulsory for all Nigerian children. The goal of Junior Secondary School is to enable students to acquire knowledge and skills which will prepare them for useful living within the society. In specific term, Junior Secondary School Education should give learners opportunity to discover

and develop their potentials. The three main objectives of Basic Technology as stated in the national policy of Education are: to Provide pre- vocational orientation for further training in Technology; to provide Basic Technology literacy for everyday living, and to stimulate creativity (Ajani, 2009; FRN, 2013).

Basic Technology is a subject borne out of the desire of educationists of Nigeria origin to have an education that will fit into the culture and development trend of the nation. This is the kind of education that will prepare students towards acquiring manipulative skills for effective participation in nation building. This subject in addition to the above introduces a child into the world of technology. The knowledge of which can help the Nigerian child to acquire technical skills in relevant fields. But in Nigeria society today the reverse is the case. Most of these aspirations are not met and these can be traced to a number of problems which include:

Curriculum inadequacy; Problem of Funding; Problem of Equipment installation; Shortage of Trained Technical Teachers; Wrong Method of Education and Educational Policy; Inadequate Facilities and Instructional Media; and Poor Methods of Instructional Delivery (Uwaifo & Edigin, 2011).

Presently, the common method of instruction applied by teachers in secondary schools in Nigeria is lecture method which involves verbal presentation of subject matter/content. Lecture method as conventional method, is didactic, stereotype and non-result oriented. It is often described as “talk and chalk” method because its presents information to the students who merely listen. Teacher do all the talk while students listening and copy note on the chalkboard after the lesson (Akpoghol *et al.*, 2016). This teacher-centered approach dominate the educational system in Nigeria except few private schools that are well equipped with modern Information and Communication Technology (ICT) facilities such as computer laboratories with computers and internet facilities, interactive whiteboards, learning software, and many others. These schools have internet connectivity such as Wi-fi with adequate Bandwidths to enable their students learn via World Wide Web.

The World Wide Web can be used to provide instruction and instructional support. Web-based instruction offers learners unparalleled access to instructional resources, far surpassing the reach of the traditional classroom. It also makes possible learning experiences that are open, flexible, and distributed, providing opportunities for engaging, interactive, and efficient instruction (Olson & Wisner 2002). Web-based instruction offers multiple dimensions of use in education and

training environments. It is capable of providing direct instruction to meet individual learning objectives. Due to its networking capability, the Web can play additional roles. These include promoting and facilitating enrolment into courses, availing the syllabus or program of instruction, posting and submitting assignments, interacting with instructors and fellow students, collaboration on assignments, and building learning communities.

In spite of the potentials of web-based instruction, empirical studies on effects of web-based instruction is conflicting. For instance, Guzeller & Akın (2012) reported that students exposed to WBI achieved better than their counterparts exposed to the conventional instructional strategy. Also, Thrasher et al. (2012) reported that students in the web-based instruction sections of a course outperformed their counterparts in another classroom. Similarly, Yamauchi (2015) observed that students in the experimental group had a significantly higher gain score than students in the control group. In another study, Erdogan *et al.* (2009) reported that web-based education has positive effects on the improvement of academic achievement and on motivation for learning. However, Okeke & Osuagwu (2012) also reported that the students who learnt in the traditional way performed marginally better than the Technology Enhanced Learning (TEL) students. Similar to Okeke and Osuagwu's report, Wagner et al. (2011) and Stack (2015) reported no significant difference in student performance between the two modes of course delivery (online and traditional instruction).

Achievement according to Adeyemi (2008) is the scholastic standing of a student at a given moment. It has to do with the successful accomplishment of goal(s). The purpose of testing an achievement is to help the teacher and the students evaluate and estimate the degree of success attained in learning a given concept. It is also useful in testing the retention of information and skill. It is equally appropriate in determining the efficiency of instruction. One of the issues at stake in education today is students' achievement measure in relation to teaching and the overall success of learning outcome, Use of place-based learning teaching method in teaching simple machine by basic science and technology teachers may make Basic science and technology lesson objective stimulating and interesting to the students

Retention which is an ability to remember or recognize the content that has been learned or experienced is an importance issue in teaching and learning.

Learning is complete when knowledge can be transferred into a new situation. The need to have varied practice tools is to facilitate transfer and enhance retention process. Studies on types of

learning tools that promote students' retention is yet to be concluded. For instance, Shieh & Yu (2016) revealed that guided discovery instruction influenced learning retention.

Statement of the Problem

Students' achievement in basic technology has been quite unsatisfactory over the years. Consequently, most students could not pass the "NABTEB/NECO" Examination which serves as a ticket to wage-employment, self-employment or transiting to tertiary institutions. When students could not obtain the ticket (certificate) after graduation as a result of poor achievement, they become easy prey to social menace such as stealing, thuggery, advance-fee-fraud, political extremism and even some resort to "Okada" riding. There is need to make frantic efforts of improving pedagogical styles in order to enhance better understanding of difficult concepts in Basic Technology now that achievement in the subject is alarming. Some researchers have attributed students' poor achievement to poor teaching/instructional method arising from mismatch between the students and the teachers/instructors. The method employed by the instructors are not symmetrically aligned with modern ways of teaching new generations, when teachers are teaching in the class, students are also busy browsing with their phones or iPads.

Nowadays, it is obvious that technological developments have resulted into new ways by which students collect educative information/material especially via web-based package. Therefore, it is highly necessary to introduce the new technological tool into teaching and learning Basic Technology. Therefore, the problem of the study put in question form; what is the effect of a web-based on students' achievement and retention in basic technology in Niger State?

Purpose of the Study

1. Examine the effect of web-based instructional package on students' achievement in Basic Technology.
2. Examine the effect of web-based instructional package on students' retention of learning in Basic Technology.

Research Questions

1. What is the effect of web-based instructional package on students' mean achievement scores in basic technology?

2. What is the effect of web-based instructional package on students' mean retention of learning scores in basic technology?

Hypotheses

The following null hypothesis were tested at .05 level of significance

HO₁: There is no significant difference between the mean achievement score of students taught basic technology with web-based instructional package and those taught with conventional learning method.

HO₂: There is no significant difference between the mean retention scores of students taught basic technology with web-based instructional package and those taught with conventional learning method.

METHODOLOGY

Quasi-Experimental design was used for this study. The study was carried out in Minna, Niger State. The population for this study comprised of all second year junior secondary school students in Minna, Niger State. Stratified random sampling was used to select 102 JSS2 students from two junior secondary schools in Minna, Niger State. The following two instruments were developed and used for the purpose of data collection by the researcher; Basic Technology Achievement Test (BTAT). The BTAT was subject to face validation. The face validation was done by two experts in Industrial and Technology Education Department, Federal University of Technology, Minna. A trial test was conducted to determine the reliability of the test instrument (BTAT) in Government Secondary School, Chanchaga which is not part of the selected schools. The 40 items were administered on a sample of forty (40) second year students in the school. The reliability coefficient of the test was calculated to be 0.81 using Kuder-Richardson 21 (K-R 21) method. The scores obtained in the administration of the two tests were correlated using Pearson's Product Correlation technique. The coefficient of stability computed was 0.96. The data generated from this study was analysed using the statistical package for Social Sciences (SPSS). The data collected from the administration of pre-test, post-test, retention test (lead post-test) was analysed using mean and standard deviation to answer the research questions. The pre-

test post-test mean gain of each of the treatment group was computed to determine the effects of web-based instructional package and conventional method on students' achievement and retention in basic technology. Meanwhile, analysis of covariance (ANCOVA) was used to test the Hypotheses formulated at 0.05 level of significance.

RESULTS

Research question 1

What is the effect of web-based instructional package on students' mean achievement scores in basic technology?

Table 1
Mean and standard deviation of pretest and post test scores of Experimental and control Groups in the Basic Technology Achievement Test.

Group	No of Sample	Pretest	Post test		Mean		Gain
			\bar{X}	S.D	\bar{X}	S. D	
Experimental Group	49	18.13	9.81	64.95	7.98	46.82	
Control Group	53	19.63	6.77	43.23	10.06	23.61	

The data presented in Table 1 shows that the experimental group had a mean score of 18.13 in the pre-test and a mean score of 64.95 in the post-test making a pre-test, post-test mean gain in experimental group to be 46.82. The control group had a mean score of 19.63 in the pre-test and a post-test mean of 43.23 with a pre-test, post-test mean gain of 23.61. With this result, the students in the experimental group taught basic technology using web-based instructional package improved more than the control group taught using conventional learning strategy. Hence, web-based instructional package is more effective than the conventional teaching method on students' achievement in basic technology.

Research Question 2

What is the effect of web-based instructional package on students' mean retention of learning scores in basic technology?

Table 2

Mean and Standard Deviation of the posttest and retention scores of experimental and control groups in basic technology

Group	No of Sample	Posttest		Retention test		Mean Loss
		Mean	Standard Dev	Mean	S. D	
Experimental	49	64.95	9.87	59.13	7.26	5.82
Control	53	43.23	8.77	36.21	7.58	7.02

Table 2 shows that the experimental group had a mean score of 64.95 in the post-test and a mean score of 59.13 in the retention test with mean loss score of 5.82. The control group had a mean score of 43.23 in the post-test and retention mean score of 36.21 with a post-test, retention mean loss of 7.02. With this result, the experimental group retention of learning is higher than the retention of learning of the student in the control group. The results therefore indicate that students taught basic technology with web-based instructional techniques retained their learning better than those taught with the conventional learning strategy.

Hypotheses

HO₁: There is no significant difference between the mean achievement score of students taught basic technology with web-based instructional package and those taught with conventional learning Method.

Table 3:

Summary of Analysis of covariance (ANCOVA) for Test of Significance of effect of treatment on students' achievement in Basic technology.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1410.617 ^a	2	705.309	8.460	.000
Intercept	27465.914	1	27465.914	329.443	.000
Pretest	59.831	1	59.831	.718	.399

Treatment	1086.101	1	1086.101	13.027	.000
Error	8253.696	99	83.371		
Total	534408.000	102			
Corrected Total	9664.314	101			

a. R Squared = .146 (Adjusted R Squared = .129)

The data presented in Table 3 shows F-calculated values for mean scores of experimental and control groups in basic technology achievement test. The F-calculated value for group is 13.027 with a significance of F at .000 which is less than .05. The null-hypothesis is therefore rejected at .05 level of significance. With this result, there is significance between the mean achievement scores of students taught basic technology with web-based instructional package and those taught with Conventional Learning Method (CLM).

HO₂ : There is no significant difference between the mean retention scores of students taught basic technology with web based instructional package and those taught with conventional learning method.

Table 4: Summary of Analysis of covariance (ANCOVA) for Test of Significance of effect of treatment on students' retention in Basic technology.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	11358.872 ^a	2	5679.436	3192.545	.000
Intercept	110.766	1	110.766	62.264	.000
Posttest	8096.941	1	8096.941	4551.482	.000
Treatment	373.681	1	373.681	210.055	.000
Error	176.118	99	1.779		
Total	407975.000	102			
Corrected Total	11534.990	101			

a. R Squared = .985 (Adjusted R Squared = .984)

The data presented in Table 4 shows that F-calculated value for the group is 210.055 with a significance of F at .000 which is less than .05. Hence, the null-hypothesis was rejected at .05 level of significance. The result means that there was a significant difference between the mean scores of student taught basic technology (BT) with web-based instructional package and those

taught with Conventional Learning Method in the test for retention of learning. This shows that the experimental group taught basic technology using web based instructional package retained more than the control group taught using Conventional learning method.

Discussion of Results

The findings of this study are discussed in this section under different aspects dealing with effects of a web based instructional package on basic technology students in science and technical colleges. The data presented in Table 1 shows that the mean score for experimental group was 64.95 and that of the control group was 43.23. From the result, the students in experimental group performed better than those in control group in basic technology achievement test. At the same time, Analysis of covariance was used to test the first hypothesis, Table 3, at the calculated F-Value (13.02), significance of F (.000) and confidence level of .05, there was a significant difference between mean achievement scores of students taught Basic Technology with WEBIP and those taught with CLM. This confirmed that the mean difference was statistically significant. The implication of this finding is that WEBIP is more effective than CLM in enhancing students' achievement in studying Basic Technology. This finding compared favourably with the finding of Daramola, Onasanga and Asuquo (2016), who studied the effect of computer Assisted Instruction (CAI) in teaching Introductory Technology. The study revealed that the students who were taught with CAI made statistically significant improvements in their test scores. It can be therefore be concluded that the use of WEBIP to teach Basic Technology contents in technical college curricula helped students to visualize processes that seem abstract and complex more than when the use of CLM is employed.

The data presented in Table 2 revealed the finding that students taught Basic Technology with WEBIP had higher mean score in the test for retention of learning than those taught with

CLM. Analysis of covariance was employed to test the seventh hypothesis, Table 4, at the calculated F-value 210.055 with a significance of F at .000 with confidence of .005, there was a significant difference between the mean scores of students taught Basic Technology with WEBIP and those taught with CLM in the test for retention of learning. This finding indicates that Web based instructional package is more effective for improving students retention of learning in Basic Technology than CLM. According to Abimbade, et al (2011), computer technology, provides powerful tools to support the shift to students-centred learning and is capable of creating a more interactive and engaging learning environment for teachers and learners. The use of computer technology for teaching also helps in inculcating in the students' workplace basic skills such as learning to learn, creativity, problem solving skills, and higher order thinking skills which increases the students' flexibility (Heinichi *et al.*, 2014). Chi, et al (2014) was of the opinion that by teaching students to think, they will gradually begin to realise that conscious reflection secretes understanding which helps in transfer of learning and improves students' retention of learning.

Conclusion

The usage of computers in and outside the classrooms especially surfing for materials on-line is one of the popular activities today and the ratio of computer Assisted Instruction (CAI) has been rising day by day with advancement in technology, whether computer should be used in schools is no longer the issue in education; instead, the current emphasis is to ensure computer is used effectively to create opportunities for learning, promote students achievement and make productive citizens in the 21st century. Hence, researchers today are not searching if the computers are effective for educational and instructional activities but searching how to use computers more effectively. Deductively from the findings of this study, WEBIP improves the students' achievement and retention of learning better than when conventional method is used

for teaching. Students are highly enthusiastic and interested using WEBIP in and outside the classroom. Considering the achievement level of the students in the experimental and conventional groups, those in experimental group outperformed their counterpart in control group. These results therefore showed that web-based instruction is more supportive in teaching technique than when only conventional learning methods is employed for teaching basic technology to science and technical colleges students.

Recommendations

Based on the findings of this study, the following recommendations were proffered;

1. Government at all levels should give more attention to the adoption of modern and interactive packages like web-based instructional package in teaching of Basic Technology.
2. Teachers of basic technology should prepare their lessons in such a way that the students are given ample opportunity to interact freely with the Internet connected computers. This will go a long way to improve their academic achievement.
3. Workshops, seminars and conferences should be organized by Federal and State Ministries of Education and School Administrators to enlighten teachers and improve their knowledge and skills on the use of computer in order to utilize it for improving students' achievement and retention in basic technology.

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