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Effect of Electronic-Learning on the Academic Achievement of Basic Science Students in Bayelsa State, Nigeria

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Abstract

The study investigated the effect of electronic-learning on the academic achievement of basic science students in Yenagoa Local Government Area, Bayelsa State, Nigeria. A pretest, posttest, control group, quasi-experimental design was adopted. One hundred and four (104) JS.2 students from two government owned junior secondary schools in Yenagoa Local Government Area were purposely selected for the study. The schools were randomly assigned to experimental and control groups. The study lasted for five weeks. Three instruments IGELS, IGMLM and BSAT were used for the study. One research question was posed and answered using mean and deviation standard and one null hypothesis was tested at 0.05 level of significance using analysis of covariance (ANCOVA). The findings revealed that those taught with e-learning had a higher mean (72,33) than those taught with modified lecture method (50.59) with a mean difference of 21.74. E-learning had significant effect on student's academic achievement in basic science. ($f_{1,101}=76.392$; $p<0.05$ partial eta squared=0.558), with an effect size of 55.8%. Finding showed that there was a significant difference in students' achievement in basic science when taught with e-learning and modified lecture method; the e–learning students performing better. It was recommended that government should provide e-learning materials for schools and train the teachers to acquire the basic skills.

Key Words: Electronic learning, IGELS, IGMLM and BSAT

Introduction

It has become so glaring to everyone that the world has become a global village. People are becoming more and more familiar to the use of smart phones, computers and other technological devices used in accessing the internet on a daily basis. The introduction of

multimedia technologies and the internet in learning has been observed as a vital means of improving accessibility and quality of delivery of learning among students and teachers in secondary schools (Fayomi, Ayo, Ajayi & Okorie, 2015).

Electronic- learning which is also referred to as e-learning is seen as a good tool that can be used to enhance learning. It is a shift from the conventional teaching and learning style to an Information and Communication Technology, (ICT)-based, personalized, flexible, self-organized, collaborative learning, based on a community of learners, teachers, facilitators and experts (Olojo, Adewumi & Ajisola, 2012).

E-learning makes use of computers, laptops, mobile phones, android phones etc, which most secondary school students have access to. These components are either owned by the students or their parents, therefore could watch a video on what was taught in the class for better understanding. The use of these facilities in the classroom and at home could make abstract concept to become very real to the students.

Basic science which is also known as integrated science is a core subject in the Nigerian school system (FRN, 2014). Arbon in Opara (2011) says science help students to gain an understanding of the role and function of science in everyday life and the world in which they live. He further argued that the integrating principles as found in basic science are intended to produce a course which is relevant to students' needs and experiences and lays adequate foundation for subsequent specialist course of study and also adds a cultural dimension to science education. Through the process of integration of science:

    i.   there is an increased scientific literacy.

    ii.   the students are exposed to the process of science.

    iii. the students have increased interest in science.

    iv. the students see science as one with no clear boundaries of individual subjects.

    v. the relationship of science to society is clearly seen.

    vi. the students imbibe the scientific attitudes.

vii. the students use the laws, theories, facts, principles and generalizations in science to solve daily problems.

Research findings have shown that the performance of students in the science subjects have not been encouraging (Akpan, 2012 & Moses, 2013). Factors responsible for this poor performance have been attributed to inadequate textbooks, lack of learner's interest, unqualified science teachers, lack of well-equipped laboratories, psychological fear of science subjects, and teaching methods/ strategies (Akpan, 2008 & Moses, 2012).

Okebukola (1997) indicated that science teaching is mostly done with lecture method which promotes role learning. This approach is not good enough for science teaching. Even when the science curriculum recommended the guided discovery method for most science topics, other conventional methods are still being used in science teaching and learning largely due to lack of instructional materials.

Akpan (2008) argued that most of the junior secondary schools in the Nigerian school system lack adequate laboratories. This will obviously affect the effective teaching and learning of basic science.

Sunday, Ayooluwa, Olaniyi (2015) in their research findings discovered that e-learning further develops students computer skills, encourages students' way of learning, and helps students to study content in a way that showed connection between subjects. They further stressed that, e-learning makes students to have infinite access to unlimited information of varying degrees. Also, that e-learning allows students to use various kinds of technology to conduct research, communicate and create knowledge. Similarly, Oye, Inhad, Madar and Rahin (2012) in their findings observed that e-learning has significant impact on students' academic performance. Oleabhiele (2015) who discovered that e-learning has significant effects on students' mean achievement score than those taught with lecture method. In another research, Owino (2013) found out that students taught with the e-learning performed lower than those taught with conventional study mode.

Statement of the Problem

The discouraging performance of students in basic science in junior secondary schools in Nigeria has been a concern to science educators and researchers over the year. One of the factors attributed to this, is the use of conventional teaching methods like the lecture method which has been in use over the decades. These methods have led to rote learning of science, hence affecting the effective delivery of science. Modern innovative strategies are therefore being sort for by researchers. With the advent of ICT, the e-learning strategy could be used to see, if there could be an improvement in the performance of students in basic science, hence this study, effect of e-learning on the academic achievement of basic science students.

Purpose of the Study

The purpose of this study is to investigate the effect of electronic-learning on the academic achievement of basic science students in junior secondary schools in Yenagoa Local Government Area of Bayelsa State, Nigeria. Specifically, the study is to find out the difference that exists in students' achievement in basic science, when taught with e-learning and modified lecture method.

Research Question

One research question was raised for the study:

   i.   What difference exists in students' achievement in basic science when taught with e-learning and modified lecture methods?

Research Hypothesis

One hypothesis was tested for significance at alpha level ≤0.05.

   i.   There is no statistically significant difference in students' achievement in basic science when taught with e-learning and modified lecture method.

Method

The study adopted the pretest, posttest, control group, quasi-experimental design. A 2X2 factorial matrix was adopted with instructional strategies (e-learning and modified lecture method) as treatments.

The study was done in two junior secondary schools in Yenagoa Local Government Area of Bayelsa State, Nigeria. The two schools were purposively selected and assigned to treatment and control groups based on the following criteria.

i. The schools must be public schools.

ii. The school must have qualified basic science teachers.

Intact classes were used: The experimental group was taught using e-learning, while the control group was taught using modified lecture method. JSS 2 students were used in both schools. One of the schools was randomly selected as experimental group and the other as control. A total of 104 students (51 males and 53 females) were used for the study.

Three instruments were used for study namely:

i. Instructional Guide on E-learning Strategy (IGELS).

ii. Instructional Guide on Modified Lecture Method (IGMLM).

iii. Basic Science Achievement Test (BSAT).

The instruments were developed by the researchers. BSAT had a reliability coefficient of 0.88 using Kuder-Richardson formula 21(KR-21). The instruments were validated by experts.

The first week was for the training of the teachers on the use of IGELS and IGMLM. The second weeks was used on the administration of the pre-test on BSAT. The next two weeks were used for the administration of the treatment on the experimental group (IGELS) and the control group (IGMLM). The next week, which is the fifth week, was used for the administration of the post-test.

Method of Data Analysis

The data collected were analyzed using mean to provide answers to the research question, while analysis of covariance (ANCOVA) was used to test the hypothesis for significance at 0.05 alpha levels.

Results

The result of the study is presented in line with the research question and the hypothesis that guided the study.

Research question 1

What difference exists in students' achievement in basic science when taught with e-learning and modified lecture method?

Table 1: Summary of mean and standard deviation of pretest and posttest scores of basic science students taught with e-learning and modified lecture method.

Instructional strategies	N	Pretest Scores		Posttest scores		Mean gain scores
		X	SD	X	SD	
E-Learning	60	45.53	8.07	72.33	8.76	26.80
Modified Lecture method	44	38.18	8.77	50.59	8.65	12.41
Total	104	42.31	9.031	9.06	63.13	20.82

Table 1 revealed that, the pretest mean score of those taught with e-learning instructional strategy was 45.53 with a standard deviation of 8.07, while those taught with modified lecture

method had a pretest mean score of 38.18 with a standard deviation of 8.77. The difference in the mean score was 7.35.

The table also showed that, the post-test mean score of those taught with e-learning instructional strategy was 72.33, with a standard deviation of 8.76. A mean gain of 26.80 was recorded compared to their pretest score. While those taught with the modified lecture method had a post-test mean score of 50.59, with a standard deviation of 8.65. A mean gain of 12.41 was also recorded compared to their pretest score. Therefore, the post-test mean score of those taught with e-learning 72.33 was greater than the post-test mean score of those taught with the modified lecture method 50.59. The same result was seen in the mean gain.

This implies that the students taught with e-learning have a greater achievement than those taught with modified lecture method.

Research hypothesis 1

There is no statistically significant difference in students' achievement in basic science when taught with e-learning and modified lecture method.

TABLE 2: One - way Analysis of Convenience (ANCOVA) of post-test scores of students' achievement in basic science when taught with e-learning and modified lecture method.

Source of Variation	Type III Sum of Squares	df	Mean Square	F	Sig. Squared	Partial Eta	Decision p <0.05
Corrected Model	12028.552	2	6014.276	78.729	.000	.609	
Intercept	13636.767	1	13636.767	178.511	.000	.639	
Pretest Scores	28.406	1	28.406	.372	.543	.004	
Instructional Strategies	9738.788	1	9738.788	127.488	.000*	.558	
Error	7715.563	101	76392				
Total	434286.000	104					
Corrected Total	19744.115	103					

R Squared = .609 (Adjusted R. Squared = .601) *= Significant at p<0.05 alpha level

The result in table 2 shows that the main effect was significant on students' achievement in basic science (f1, 101=76.392; pc 0.05; partial eta square = 0.558); which gave an effect size of 55.8 percent. Therefore, the null hypothesis which states that that there is no statistically significant difference in students' achievement in basic science when taught with e-learning and modified lecture method was not accepted.

Discussion

The findings revealed that students exposed to IGELS achieved better than those exposed to IGMLM. Also, that, the difference was significant. This finding agrees with the findings of Sunday et al (2015), Oleabhiele (2015) and Oye et al. (2012) that, the use of e-learning enhances the understanding of basic science concept which leads to greater achievements.

 This supports the fact that, listening alone is not enough in understanding scientific concepts therefore, the addition of the sense of sight to the sense of hearing will give added advantage

to those students who do not have laboratories to have hands-on, and who lack other instructional materials. However, the findings disagree with findings of Owino (2013) that, student under the conventional study mode achieved better than those under e-learning mode.

Conclusion

The findings of the study have shown that e-learning strategy is an innovative strategy for science teaching especially basic science. Teacher should endeavor to adopt e-learning strategy, now that the information and communication technology has become affordable to almost everyone. Where curriculum materials are not available, teachers and students should use available technology rather than waiting on government, since e-learning has been seen to enhance academic achievement of students in basic science.

Recommendations

Based on findings the following recommendations were made.

1. Government should provide e-learning materials and equipment for the secondary schools.

2. Basic science teachers should be trained on e-learning to develop the necessary skills on e-learning.

3. Government should provide electricity in schools.

4. Parents should provide for their wards computers or mobile phones to have access to the internet.

5. E-learning should be part of the junior secondary school curriculum.

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