

EFFECT OF E-LEARNING PLATFORMS ON JUNIOR SECONDARY SCHOOL II BASIC SCIENCE STUDENTS' ACHIEVEMENT IN JOS SOUTH LGA OF PLATEAU STATE

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Abstract

This study investigated the effect of e-learning platforms on junior secondary school II basic science students achievement in Jos South LGA of Plateau State. The design for the study was quasi-experimental. A total of 100 Junior Secondary School II Basic Science (JSS2) students from three sampled schools were used for the study. The instrument was Basic Science Achievement Test (BSAT), consisted of 40 multiple-choice questions. Research assistants who were Basic Science Teachers in the sampled schools were trained by the researchers and used in teaching, administering tests, and marking. A pilot study was conducted in another school different from the schools used for the study, and was used to determine the reliability of the instrument of at 0.81. The four research questions were answered using mean and standard deviation while the hypotheses were tested using t-test and ANCOVA for independent samples at 0.05 significance level. The results of the study indicated that students taught using e-learning platforms had higher achievement scores than those exposed to conventional teaching methods. (provide two or more additional findings, please). Based on these findings it was concluded that students' achievement in Basic Science is increased when e-learning platforms are used. The researchers recommend that E-learning platforms should be used to teach Basic Science in junior secondary schools.

BACKGROUND

Education is the process of acquiring knowledge, skills, values, and understanding through formal instruction, training, or self-directed learning. It involves the transfer of information and the development of intellectual, social, and practical abilities that enable individuals to grow, adapt, and contribute to society. Education can take place in various settings, including schools, universities, workplaces, and informal environments, and it plays a fundamental role in personal development and societal progress. Education is the simple process of learning and knowing, and it prepares oneself or others intellectually for a mature life (Iolanda, 2013).

Nigeria's National Policy on Education (2014) defines education as an instrument of excellence for national development. The national educational goals, which were derived from the philosophy of education in Nigeria, include the training of the mind in understanding the world around, the acquisition of appropriate skills, and the development of mental, physical, and social abilities and competencies as equipment for the individual to live in and contribute to the development of the society. These goals can be achieved through science education.

Science can be defined as a systematically organized body of knowledge (Pranchi, 2015) involving the intellectual and technical step-wise study of the forms and behavior of the physical and natural world. Science education refers to the teaching and learning of scientific principles, concepts, methods, and practices. It encompasses a structured approach to imparting knowledge about the natural world, including physics, chemistry, biology, and other scientific disciplines. Basic science education aims to foster critical thinking, inquiry, problem-solving skills, and a deep understanding of scientific processes at an early stage of a child's learning process. It is crucial for preparing individuals to engage with and contribute to the advancements and challenges of the modern world, as science plays a central role in technological, environmental, and societal developments. Basic Science education can take place at various levels, from primary school through JSS 1 to JSS3 primary, and it can also involve informal learning through museums, science centers, and other educational resources.

The use of information and communication technology for the learning process is called E-learning. E-learning, short for electronic learning, refers to the use of digital technology, primarily the internet and computers, to deliver educational content and instruction. It encompasses a wide range of online courses, virtual classrooms, educational websites, and digital resources that facilitate learning outside of traditional brick-and-mortar classrooms. E-learning provides flexibility in terms of when and where learning takes place, making it accessible to a diverse range of learners, from students in formal education settings to professionals seeking to acquire new skills or knowledge. It can involve various formats, including video lectures, interactive modules, quizzes, and discussion forums, and it has become increasingly popular in both formal and informal education. Anderson (2014) reported on several international studies that suggest that the mere use of technology in the classroom does not guarantee learning improvement.

An E-learning platform is an online learning platform with an integrated set of interactive online services that provide trainers, learners, and others involved in education with information, tools and resources to support and enhance education delivery and management. E-learning has become a rapidly popular learning approach in higher educational institutions due to the rapid growth of Internet technology. E-learning uses information and communication technology (ICT) to enhance and facilitate teaching and learning. The main aim of e-learning is to increase the accessibility of education reduce the costs and time, and improve student academic achievement

An e-learning platform is a digital software or website designed to facilitate the delivery of educational content and learning experiences over the Internet. These platforms provide a centralized space where instructors or educators can create, manage, and deliver courses or training materials, and where learners can access and engage with this resource. As E-learning is becoming more popular in classroom learning, those concerned with the development of education (teachers, learning technologists) want to understand learning in this changing technological environment. In e-learning, two major traditions have been prevalent: one where connections are made with people and the other where they are made with assets (electronic gadgets). These two distinct streams show a different emphasis: the first has communication and interaction between people at the heart of learning, and the second focuses on engagement with resources. E-learning is characterized by human-human interaction (between students, fellow students, and teachers) and human-machine interaction (between students and e-learning software) to support the learning process. Several studies point out that men and women differ in their interaction with technology. This study also explores if there are gender differences regarding the use of E-learning platforms in schools.

STATEMENT OF THE PROBLEM

Education is important, and there is increasing pressure for developing countries to catch up with the developed world. The number of children attending primary school globally has grown to 800 million today, covering nearly 90% of the world's school-age children. But the difference in average levels of education between rich and poor countries remains enormous. Without a fundamental rethinking of current education approaches, it will take another 100 years for children in developing countries to reach the education levels achieved in developed countries (Amadi, 2023).

The COVID-19 pandemic opened the eyes of the world to new realities, such as the need for remote working and school. During the lockdown, in many parts of the world, students and teachers were unable to go to their offices and classrooms. Schools were pressured to operate using electronic means (Nnjoku et al, 2022). Many school administrators had to adopt strategies for continuous learning during the lockdown. Remote teaching was done through online learning management systems such as Canvas, Zoom, Edmodo, Google Classroom, and Microsoft Teams (Ebohon, Obieniu, Irabor et al., 2021). Even with the fact that e-learning was new to many Nigerian schools and students, many secondary school students still attended various online classes, and they did not allow the problem of poor internet connection or lack of enough digital resources to attend the classes to hinder their involvement (Adekunle & Ojo, 2021).

Many e-learning platforms became popular during this period, and examples of such platforms include Blark Pryde Academy, Ulesson, Khan Academy, and Byjus (Amadi, 2023). Parents across the country were worried about the continuous stay of students at home; many of such parents had to subscribe to any of the numerous online learning platforms to keep their children (the Students) engaged during that time (Obinna, 2020). E-learning is said to have shown significant growth over the last decade as the internet, electronic resources, and education combine to allow people to acquire more knowledge and skills (Koksall, 2020).

AIM AND OBJECTIVES

The aim of the study was to investigate the impact of E-learning Platforms on Junior Secondary School II Basic Science Students' achievement in Jos South local government area of Plateau State, Nigeria.

Specifically, the objectives of this study were to find the difference:

1. between the pre-test and post-test mean scores of the control group taught using e-learning platforms.
2. between the pre-test and post-test mean scores of the experimental group taught using e-learning platforms.
3. between the pre-test and post-test mean scores of the experimental and control groups taught using e-learning platforms.
4. in the mean achievement scores between male and female SS2 taught Biology students in using e-learning platforms.

RESEARCH QUESTIONS

The following research questions were answered in the course of the study:

- (a) What is the difference between the pre-test and post-test mean scores of the control group?
- (b) What is the difference between the pre-test and post-test mean scores of the experimental groups?
- (c) What is the difference between the pre-test and post-test mean scores of the experimental and control groups taught using e-learning platforms?
- (d) What is the difference in the mean achievement scores between male and female SS2 taught Biology students in using e-learning platforms?

HYPOTHESES

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

HO1: No significant difference exists between the control group's pre-test and post-test mean achievement scores.

HO2: No significant difference exists between the experimental group's pre-test and post-test mean achievement scores.

HO3: There is no significant difference in the mean achievement score of students taught digestion using e-learning platforms and those taught using the conventional lecture method of teaching.

HO4: There is no significant difference in the mean achievement scores between male and female basic science students taught using e-learning.

METHODS

This section describes the methodologies used in this research work under the following headings: research design, population, sample, instrument for data collection, validity, reliability, method of data analysis, and sampling techniques.

RESEARCH DESIGN

The research design adopted for this study is a quasi-experimental and specifically, the pre-test and post-test non-equivalent control group design. This design was considered appropriate for the study because intact classes were used to avoid disrupting normal class lessons and to control extraneous variables. It was used to determine the effect of e-learning on academic achievements among senior secondary school students offering basic science.

The experimental group was exposed to Blark Pryde Academy an e-learning platform, while the control group was exposed to a lecture method. The control group was taught the same topic as the experimental group but using the lecture method. This procedure was for four weeks with two lesson periods of 80 minutes with the help of three research assistants trained in using E-learning and traditional lecture methods approach in Jos South LGA Education Zone.

POPULATION AND SAMPLE OF THE STUDY

Population

The population of this study consists of all JSS II Basic Science Students in Jos South LGA made up of two hundred and thirteen 213 se LGA condary schools in Jos South (Plateau State Ministry of Education) from which three (3) schools.

Sample

A total of 100 Students formed the sample size of the study. The sample size was selected from three sampled schools from the population of junior secondary school students of basic science in Jos South Local Government Area.

Sampling Technique

The purposive sampling technique was used to select 3 out of the 213 Junior Secondary Schools in Jos South Local Government Area. The reason for choosing purposive sampling is that the researcher chose schools with functional ICT centers and at least two groups of JSS2 classes. The 3 schools include both private and public schools. A basic science achievement test was administered to the sample group. A pre-test was administered to a similar group of students from schools not part of the study sample. After that analysis, necessary corrections and a review of the instrument were made. Students from one arm of intact classes served as the experimental group, while students of the next arm of the same class (JSS2) of basic science students served as the control group.

INSTRUMENT FOR DATA COLLECTION

The instrument used for the study is the Basic Science Achievement Test (BSAT).

Description of the Instrument

The researchers constructed the instrument to assess students' understanding of drug abuse, a concept in basic science. Forty (40) questions were selected for the basic science achievement test. The questions used in this test were directly derived from Junior School Certificate Examination (JSCE) questions.

Procedures for Instrument Development

The researchers constructed the Basic Science Achievement Test (BSAT) to determine students' understanding of 'digestion'. The test consists of sections A and B. Section A sought for the data of basic science students. The section includes gender, class, age, and school name (optional). Section B consists of 40 multiple-choice item questions from basic science specifically, digestion. The multiple-choice items have one correct and three incorrect answers for each item.

RESULTS AND DISCUSSION

The results are presented in tables according to the research questions and hypotheses that guided the study.

RESULTS

Research Question One: What is the difference between the pre-test and post-test mean scores of the control group?

Table 1: *Mean and Standard deviation of pre-test and post-test scores of the control group*

Pre-Test			Post-test			Mean Gain
N	Mean	SD	N	Mean	SD	
25	17.20	3.971	25	22.30	2.39	5.10

Table 1 shows the control group's mean and standard deviation of pre-test and post-test scores. The pre-test mean achievement score for the control group was 17.20, with a standard deviation of 3.971. The post-test achievement mean score for the control group was 22.30, with a standard deviation of 2.319. The mean gain score was 5.10. This implies a relative improvement in the post-test mean achievement score of students in the control group.

Research Question Two: between the pre-test and post-test mean scores of the experimental groups taught using e-learning platforms

Table 2: *Mean and Standard deviation of pre-test and post-test scores of the experimental group*

Pre-test				Post-Test		
N	Mean	N	Mean	Mean Gain		
2	15.05		3.816	25	25.95	3.086
	11.10					

Table 2 shows the *mean and standard deviation of the pre-test and post-test scores of the experimental group*. This group's pre-test mean achievement score was 15.05, with a standard deviation of 3.816. The post-test achievement mean score for the experimental group was 25.95, with

a standard deviation of 3.816. The mean gain score was 11.10. This implies that there was also relative improvement in the mean achievement scores of students in this group.

Research Question Three: What is the difference between the pre-test and post-test mean scores of the experimental and control groups taught using e-learning platforms

Table 3: Mean and Standard deviation of pre-test and post-test scores of the experimental group and control group

Variable	Pre-test			Posttest			
	N	Mean	SD	N	Mean	SD	Mean Gain
Method of Teaching							
Control group	25	17.20	3.971	25	22.30	2.390	5.10
Experimental group	25	15.05	3.816	25	25.95	3.086	11.10

Table 3 shows the mean and standard deviation of the pre-test and post-test scores of the experimental group and control group. The pre-test mean achievement score for the control group was 17.20, with a standard deviation of 3.971. The pre-test mean achievement score of the experimental group was 15.05, with a standard deviation of 3.816, indicating a slight difference between the pre-test mean achievement scores of both groups. The post-test mean achievement score for the experimental group was 25.95 with a standard deviation of 3.086, while the post-test mean achievement score for the control group was 22.30 with a standard deviation of 2.390. The mean gain for the experimental group was 11.10, while that of the control group was 5.10, implying that the experimental group had higher achievement scores than the control group.

Research Question Four: What is the difference in the mean achievement scores between male and female SS2 taught Biology students in using e-learning platforms?

Table 4: Mean and Standard deviation of pre-test and post-test scores of males and females in the experimental group

Variable	pre-test			post-test		
	N	Mean	SD	N	Mean	SD
Gender						
Gain						
Male	25	15.10	3.215	25	24.40	2.184
Female	25	13.65	2.403	25	27.05	3.171

Table 4 shows the mean and standard deviation of the pre-test and post-test scores of male and female students in the experimental group. The pre-test mean achievement score of male students was 15.10 with a standard deviation of 3.215, while that of the female students was 13.65 with a standard deviation of 2.403. This implies that males had slightly higher mean achievement scores than females in the pre-test.

The post-test mean achievement score for male students was 24.40 with a standard deviation of 2.184, while the post-test mean achievement score for female students was 27.05 with a standard deviation of 3.171. The mean gain for male students is 8.20 while that of the female students was 11.10; this indicates that females have higher achievement scores than males in the post-test.

HYPOTHESES

Hypothesis one: No significant difference exists between the control group's pre-test and post-test mean achievement scores.

Table 5: T-test analysis of Mean scores between pre-test and post-test of students taught using the lecture method

Mean Tailed)	Std. Deviation	N	df	t	Sig (2-
5.100	4.551	25	19(how?)	6.568	.000

The results of data analysis in Table 5 show the p-value associated with the pre-test and post-test mean score for the conventional teaching method on a significant level of 0.05. A t-value of 6.568 was obtained with a p-value of 0.00. Since the p-value of 0.00 is less than 0.05, the set significance level, the null hypothesis (H01), which states that there is no significant difference between the control group's pre-test and post-test mean achievement scores, is rejected. Hence, there is a considerable difference in the pre-test and post-test scores of the students taught with the conventional teaching method.

Hypothesis two: No significant difference exists between the experimental group's pre-test and post-test mean achievement scores.

Table 6: t-Test Analysis of Mean scores between pre-test and post-test of students taught using e-learning method

Mean Tailed)	Std. Deviation	N	df	t	Sig (2-
11.00	4.991	25	19	10.338	.000

The results of data analysis in Table 6 show the significant value associated with the pre-test and post-test mean score for using E-learning platforms on a significant level of 0.05. The t-value obtained was 10.338 with a p-value of 0.00, less than 0.05, the set significance level. Therefore, the null hypothesis (H02), which states that there is no significant difference between the experimental group's pre-test and post-test mean achievement scores, is rejected. Hence, there is a significant difference in the students' pre-test, and post-test scores taught using E-learning platforms.

Hypothesis Three: There is no significant difference in the mean achievement score of students taught drug abuse using e-learning platforms and those taught using the conventional teaching method.

Table 7: Analysis of Covariance (ANCOVA) of the significant difference in the mean achievement score of students taught drug abuse using e-learning platforms and those taught using the conventional teaching method.

Source Sig	Sum of Squares	df	Mean Square	F
Corrected Model	71.019 ^a	2	35.510	4.653
Intercept	1196.735	1	1196.735	156.821
Pre-test	.794	1	.794	.104
Group	52.821	1	52.821	6.922
Error	282.356	37	7.631	
Total	28709.000	40		
Corrected total	353.375	39		

The result in Table 7 shows an analysis of the significant mean achievement score of students taught digestion using E-learning platforms and those taught using the conventional teaching method on a significant level of 0.05. The result shows that for the groups taught digestion using e-learning platforms and those taught using the lecture method, an F-ratio of 6.92 was obtained with an associated probability value of 0.12. Since the probability value of 0.12 is greater than 0.05 which is the set level of significance, the null hypothesis (H03) states that there is no significant difference in the mean achievement score of students taught drug abuse using e-learning platforms and those taught using the conventional method of teaching is rejected. Therefore, the inference derived is that there is a significant difference between the mean achievement score of the two student groups, thus, showing that using e-learning platforms has a higher effect on students than the lecture method when teaching and learning drug abuse.

Hypothesis four: There is no significant difference in the mean achievement scores between male and female basic science students taught using e-learning.

Table 8: Analysis of Covariance (ANCOVA) of the significant difference in the mean achievement scores of male and female students taught digestion using e-learning platforms.

Source		Sum of Squares	df	Mean Square	F
Corrected Model		26.914 ^a	3	13.457	1.487
Intercept		632.297	1	632.297	69.783
Pre-test	.464		1	.464	.007
Gender		19.348	1	19.348	2.135
Error		154.036	17	9.061	
Total		15805.000	20		
Corrected total		180.950	19		

Table 8 shows the *analysis of the significant difference in the mean achievement scores of male and female students taught drug abuse using e-learning platforms on a significant level of 0.05. The results obtained an F-ratio of 2.135 and a probability value of 0.162. Since the probability value of 0.162 is greater than the set value of 0.05, the significance level, the null hypothesis (H03), which states that there is no significant difference in the mean achievement scores between male and female basic science students using e-learning, is accepted. This means that gender is an insignificant factor in determining students' achievement in drug abuse while using e-learning platforms.*

DISCUSSION

Statistical analysis of the research questions formulated to guide this study employed the T-test and Analysis of Co-variance for independent samples to determine the effect of e-learning platforms on the academic achievement of senior secondary school two basic science students. This study reveals a significant difference between the pre-test and post-test achievement mean scores of the control group, taught using the conventional teaching method. The pre-test mean achievement score for the control group is 17.20, with a standard deviation of 3.971. The post-test achievement

mean score for the control group is 22.30, with a standard deviation of 2.39. The mean gain score was 5.10. This indicates that there was an improvement in students' scores when the conventional teaching method was applied.

Following the statistical analysis in table 5, the p-value of 0.00 is less than 0.05, which is the set level of significance, and the null hypothesis, which states that there is no significant difference between the pre-test and post-test mean achievement scores of the control group, is rejected. Therefore, there is a significant difference in the pre-test and post-test scores of the students taught with the conventional teaching method.

Table 2 shows the ***Mean and standard deviation of the pre-test and post-test scores of the experimental group***. The pre-test mean achievement score for this group is 15.05, with a standard deviation of 3.816. The post-test achievement mean score for the control group is 25.95, with a standard deviation of 3.086. The mean gain score is 11.10, indicating an increase in students' mean scores from the pre-test and post-test. Results from statistical analysis in Table 6 obtained a p-value of 0.00 on a 0.05 level of significance. This shows that using e-learning platforms in teaching students significantly affects their achievement scores. These findings align with Taha (2014), who **investigated the Success of E-Learning in Secondary Schools: The Case of the Kingdom of Bahrain**. The main contribution of this research is that it addresses the success of e-Learning in schools.

Table 3 provides the mean and standard deviation ***of pre-test, and post-test scores of the experimental group taught with e-learning platforms and the control group*** taught with the conventional lecture method. This study indicates a significant difference between students' scores on E-learning platforms and those taught using the conventional teaching method. ***The pre-test mean achievement score of the experimental group is 15.05, with a standard deviation of 3.816, while the post-test mean achievement score for the control group is 17.20 with a standard deviation of 3.971, providing a mean gain score of 11.10 for the experimental group and 5.10 for the control group indicating a slight difference between the pre-test mean achievement scores of both groups. The post-test mean achievement score for the experimental group is 25.95 with a standard deviation of 3.086, while the post-test mean achievement score for the control group is 22.30 with a standard deviation of 2.390, providing a mean gain score of 11.10 for the experimental group and 5.10 for the control group.***

The statistical analysis in Table 7 shows that an F-ratio of 6.92 was obtained with an associated probability value of 0.12 at a significant level of 0.05. This indicates that using e-learning platforms has more effect on students' achievement than the conventional lecture method. This finding is in line with Nnadi & Blessed (2014), who compared the impact of e-learning systems and conventional methods of instruction on Biology students. It also showed that the e-learning instructional method had an edge in promoting students' academic performance over the conventional method.

Table 4 provides the ***mean and standard deviation of the experimental group's pre-test and post-test scores of males and females***. The pre-test mean achievement score of male students is 15.10 with a standard deviation of 3.215, while the pre-test mean achievement score for female students is 13.65 with a standard deviation of 2.403. The post-test mean achievement score for male students is 24.40 with a standard deviation of 2.184, while the post-test mean achievement score for female students is 27.05 with a standard deviation of 3.171. The mean gain for male students is 8.20 while that of female students is 11.10; this indicates that females have higher achievement scores than males in the post-test.

The statistical analysis in Table 8 provided an F-ratio of 2.135 and a probability value of 0.162 on a significance level of 0.05. The null hypothesis is accepted, which states that there is no significant difference in the mean achievement score of male and female biology students using e-learning. This implies that gender does not affect the achievement of biology students using e-

learning, in line with the studies of Xhonggenand Deng (2022), who mentioned that in terms of e-learning, there are no gender differences related to students' achievement.

SUMMARY OF FINDINGS, CONCLUSION, RECOMMENDATIONS AND CONTRIBUTION TO KNOWLEDGE

SUMMARY OF FINDINGS

This study aimed to determine the effect of E-learning on junior secondary school two (JSS2) basic science students' achievement in Jos SouthLGA of Plateau State, Nigeria. Four research questions and a null hypothesis guided the study. The hypothesis was tested at a 0.05 level of significance, and they included the following:

- HO1: No significant difference exists between the control group's pre-test and post-test mean achievement scores.
- HO2: No significant difference exists between the experimental group's pre-test and post-test mean achievement scores.
- HO3: There is no significant difference in the mean achievement score of students taught digestion using e-learning platforms and those taught using the conventional lecture method of teaching.
- HO4: There is no significant difference in the mean achievement scores between male and female biology students using e-learning.

The results of the study indicated that:

Students exposed to the conventional lecture method of teaching still had improvement in achievement scores

Students exposed to e-learning platforms had high achievement scores

Students exposed to e-learning platforms had higher achievement scores than those exposed to conventional lecture teaching and learning methods.

Gender is not a significant factor in students' achievement using e-learning platforms.

CONCLUSION

Based on the findings and discussion of this study, the following conclusions were made;

1. Students' achievement in basic science is increased by the conventional lecture method of teaching
2. Student's achievement in basic science is increased when e-learning platforms are used.
3. Utilisation of e-learning platforms is effective in enhancing students' achievement in basic science.
4. Gender has no significant influence on students' achievement in basic when using E-learning platforms.

RECOMMENDATIONS

Based on the implication of the study, the following recommendations were made:

1. E-learning platforms should be used to teach basic science Using e-learning platforms in teaching and learning basic science will help students develop some digital skills and eventually enhance their ability to find information on their own.
2. Teachers of basic sciences should undergo proper and regular training on using ICTs and applying e-learning platforms in teaching. E-learning platforms can provide teachers with updated information in their field of study.
3. Policymakers are recommended to consider the importance and implications of e-learning platforms while making policies that affect education at the secondary school level. This can enable them to develop policies that encourage the use of e-learning technologies to facilitate learning.

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