



Effect of Blended Teaching Instructional Approach on the Performance of Biology Students in Public and Private Senior Secondary Schools in Abeokuta South, Ogun State

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Abstract

The study investigated the effect of blended teaching instruction on the performance of biology students in public and private senior secondary schools. Quasi-experimental design was adopted. The sample consisted of 240 senior secondary two (SSII) biology students drawn from eight public and private secondary schools in the study area. Two research questions and three hypotheses guided the study. Biology Achievement Test (BAT) was used for data collection. Mean and standard deviation was used to answer the research questions while ANCOVA was used to test the hypotheses at $p < 0.05$. Result shows that the performance of students taught through blended learning was statistically significantly better than conventional learning ($F_{(1,231)} = 48.143$, $p < 0.05$). Findings revealed that private school students taught using blended method achieved significantly ($F_{(1,231)} = 4.269$, $p < 0.05$) higher than their public school counterparts. It was concluded that blended learning approach is an effective method for teaching Biology. It is therefore recommended that public school students should be more exposed to blended teaching method to enhance their performance in biology.

Keywords: Conventional, Blended, Biology Students, Instructional approach, Performance

Introduction

Advancement in information and communication technology (ICT) has tremendously triggered educational transformation in the recent years, globally (Nichol & Watson, 2003). Technological advances have become integral parts of people's lives, increasingly with each new generation (Kapoor *et al.*, 2018). This means that institutions of learning must embrace new teaching methods, integrating technological approaches for effective teaching and learning process.

Effective teaching and learning process requires the use of teaching strategies that would suit the students' learning styles and permit students' active participation (Howard, 2009). Students' active participation in the learning process encourages and provides them with the opportunities to utilize the knowledge of science in different situations (Rennie *et al.*, 2013). It repositions teaching from a largely teacher-centered, product-based activity to a more

student-centered, process-based activity (Arseven *et al.*, 2016). It encourages students to be active in the experience of learning rather than being passive learners (Lattimer, 2015).

Since traditional or conventional teaching method had failed to bring about the desired outcome of arousing inventiveness in students (Young & Collin, 2003), there would be need for teachers to replace conventional method of teaching with teaching approaches that are both student and interest centered, which could serve as a tool for combating persistent failure of students in biology (Adejoh and Idachaba, 2010). The persistent failure of students in biology at external examination bodies such as West African Examination Council (WAEC) and National Examination Council (NECO) has been consistently unimpressive (Bich & Abdullahi, 2017). This could be a threat to the field of science and attainment of science educational goals. Available data



from these examination bodies had shown decline in the achievement of students in biology (Bichi *et al.*, 2019). Considerable efforts are made by educators and policy makers at various levels to improve students' achievement in biology. One of such is teaching biology with technology tools, aimed at increasing students' engagement, interest, and motivation in learning biology and other science subjects (Bigler & Hanegan, 2011; Peterman *et al.*, 2014; Abanikannda, 2018). Enebechi (2016) pointed that the use of appropriate instructional approach in the teaching and learning of biology enhances students' performance.

In the recent time, educators are improving learning through technology as shown by the increasing adoption of technology assisted teaching methods such as blended learning approach. Blended learning involves the combination of virtual and physical environments; a learning strategy that integrates various models of traditional and distance learning and uses multiple forms of technology (Hirumi, 2011; Akbarov *et al.*, 2018). It is a form of learning that merges the face-to-face classroom learning and learning through the internet (Volchenkova, 2016). Blended learning uses more than one method to convey information in order to activate learning outcomes by the interconnection between the students and teacher (Dziuban *et al.*, 2018).

In blended learning, e-learning is integrated into traditional classroom learning, using a computer or smart classroom, where the teacher meets the student face-to-face and interaction between students and teachers is built into the course design (Karitha & Jaisingh, 2018). The essence of blended instructional approach is the cognitive load theory, on the basis that learners are engulfed by a large amount of new ideas and terminologies (Seery & Donnelly, 2012; Darabi & Jin, 2013; Seery, 2013). Blended teaching instruction had been proven to help in the transfer of right skills to the right person at the right time by connecting the right learning technologies with the right learning style for the purpose of achieving the learning objectives (Crampton *et al.*, 2012). Hence, it is pertinent to investigate the effect of blended instructional approach on the performance of biology students in public and private schools located in Abeokuta South Local Government Area of Ogun state, with the prospect of providing solution to the persistent students' failure in biology.

Research Questions

1. What is the difference between the mean performance scores of Biology students taught with conventional and blended instructions?
2. What is the difference between the mean performance scores of private and public school Biology students taught with Blended Instructional approach?

Hypotheses

- H₀₁:** There is no significant difference in the mean performance scores of students taught biology using blended instruction and conventional instruction.
- H₀₂:** There is no significant difference between the mean performance scores of students in biology based on school type
- H₀₃:** There is no significant interaction effect of instructions and school type on students' performance in Biology.

Methodology

Research Design: Quasi experimental research design adopting the pre-test, post-test, non- equivalent control group design was used to investigate the effect of blended teaching approach on students' performance in biology. It helps to establish a causal effect of independent variable (blended teaching approach) on the dependent variable (students' performance in biology), by using criteria other than randomization (Gopalan *et al.*, 2020). A 2x2 factorial matrix was built into the research design. Two dimensions of learning strategy (treatments) were used: Blended Teaching-Learning Strategies and Conventional (control group). School type operates at two levels (Public and Private).

Population of the Study: The population comprised all the secondary school II (SSS II) students and their teachers in all public and private secondary schools in Abeokuta South Local Government Area of Ogun State. This population is chosen to enable them (the teachers) lay solid foundation for students in the use of blended teaching learning strategies.

Sample and Sampling Techniques: Purposive sampling technique was used to select four public and four private secondary schools from Abeokuta Local Government Area of Ogun State. The schools were selected due to the availability of computer systems, projector and internet access. From each of the selected SSS II classes, three public and three private schools were selected as experimental participants while one



public and one private school served as control (those not exposed to blended) to make 30 students per school. A total of two hundred and forty students participated in the study.

Instrument for Data Collection: A self-constructed instrument known as “Biology Achievement Test” (BAT) was used for data collection. The instrument was divided into two sections. Section A to elicit information on participants based on the school type while section B contained 25 multiple choice questions from the biology scheme of work on “excretory system”.

Validation and Reliability of the Instrument: The instrument was subjected to face and content validation. The Biology Achievement Test (BAT) was face validated by experts in measurement and evaluation and biology education. During face validation the experts were asked to carefully examine the items in terms of relevance, general test format, suitability, and clarity. After the face validation, the instrument was corrected to reflect the experts’ contributions. The reliability of the post-test scores obtained by the sample students was tested by using split-half (odd/ even) method. Spearman-Brown Prophecy formula was applied to find out the co-efficient of reliability from the comparable value of the post-test at 0.5 levels of significance. Reliability estimate of 0.83 was obtained.

Treatment: The treatment involved two groups: Experimental and Control groups. Students in the experimental group were taught the biology concept (excretory system) using a combination of electronic technology-assisted materials with face-to-face teachers in interactive activities with students while students in the control group proceeded with their ordinary lessons which were organized around conventional teaching method. The pre-test and post-test was given to the students before and at the end of the treatment respectively to determine the effect of the treatment. Moderating variable, the school type (public and private schools) was considered to check the effect of the blended instructional approach on the performance of biology students in both public and private schools in the study area.

Method of Data Analysis: The research questions were answered using mean and standard deviation. Analysis of covariance (ANCOVA) was used as a statistical tool to correct initial differences in the dependent variable and other extraneous factors using the pre-treatment assessment scores as covariates. Estimated marginal means of participants by school type was carried out using Sidak Post-hoc analysis. The level of the significance adopted for the analysis was $p < 0.05$.

Results

Table 1: Analysis of mean scores of the performance of Biology students taught with Blended and that of those taught with the conventional approach at posttest.

Treatment Group	Pre-Test		Post-Test		Mean Difference
	\bar{x}	SD	\bar{x}	SD	
Blended Learning Approach	10.29	3.899	14.62	3.645	3.87
Conventional Approach	7.92	2.334	10.75	2.393	

The result above (table 1) shows that the mean scores of Biology students taught with Blended instructional approach (Experimental group) and that of those taught with the conventional approach (control group) at post are 14.62 and 10.75 respectively. The result also shows that the difference in the means is

3.87. It can therefore be inferred that there is a difference in the performance mean scores of Biology students taught with blended approach (experimental group) and that of those taught with the conventional approach (control group) at posttest. The experimental group has a higher mean than the control group.



Table 2: Analysis of mean scores of Private and Public Biology students taught with Blended Learning at posttest

School Type	Pre-Test		Post-Test		Mean Difference
	\bar{x}	SD	\bar{x}	SD	
Private	10.01	3.412	13.82	3.358	1.44
Public	8.73	3.582	12.38	3.912	

Result as presented in table 2 shows that the mean scores of Biology students based on the school type at post are 13.82 and 12.38 respectively. The result also shows that the difference in the means is 1.44. It

can therefore be inferred that there is a difference in the performance mean scores of Biology students based on the school type at posttest. Private schools' students had higher mean score than those in public schools.

Table 3: Summary of Analysis of Covariance (ANCOVA) of Students Performance in Biology by Treatment (Blended and Control) and School Type

Tests of Between-Subjects Effects						
Dependent Variable: Posttest						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1743.727 ^a	4	435.932	65.582	.000	.527
Intercept	1634.775	1	1634.775	245.938	.000	.511
Pretest	760.487	1	760.487	114.409	.000	.327
Treatment	335.386	1	335.386	50.456	.000	.177
School Type	26.593	1	26.593	4.001	.047	.017
Treatment * School Type	.029	1	.029	.004	.948	.000
Error	1562.069	235	6.647			
Total	44309.000	240				
Corrected Total	3305.796	239				

a. R Squared = .527 (Adjusted R Squared = .519)

Results in table 3 reveals that after adjusting for the covariance, (pre- test score in Biology), the effect of treatment on students' performance in Biology was statistically significant, $F_{(1, 231)} = 50.456$, $p < 0.05$. Consequently, the null hypothesis which stated that there was no significant main effect of treatment on secondary school students' performance in Biology was therefore rejected. The table further showed that the Partial Eta Square (η^2) was .177, which was considered

to be medium effect size according to Cohen (1988). The simple implication of this is that 17.7% of the variance experienced in students' performance in Biology was accounted for by the treatment.

In order to determine which group differs significantly among the two treatment groups, Sidak Post-hoc analysis was conducted. The results are as presented in tables 4 and 5.

Table 4: Estimated Marginal Means of Students' Performance in Biology by Treatment

Dependent Variable: Posttest				
Treatment Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental Group	14.091 ^a	.226	13.645	14.536
Control Group	11.544 ^a	.277	10.999	12.089

a. Covariates appearing in the model are evaluated at the following values: pretest = 9.34.

Table 4 further revealed that Experimental group (Blended instruction) has the highest mean score of (\bar{X} = 14.091) while the control group has the least mean score of (\bar{X} = 11.544).

Table 5 : Pairwise Comparison of Students’ Performance in Biology by Treatment

Dependent Variable: Posttest

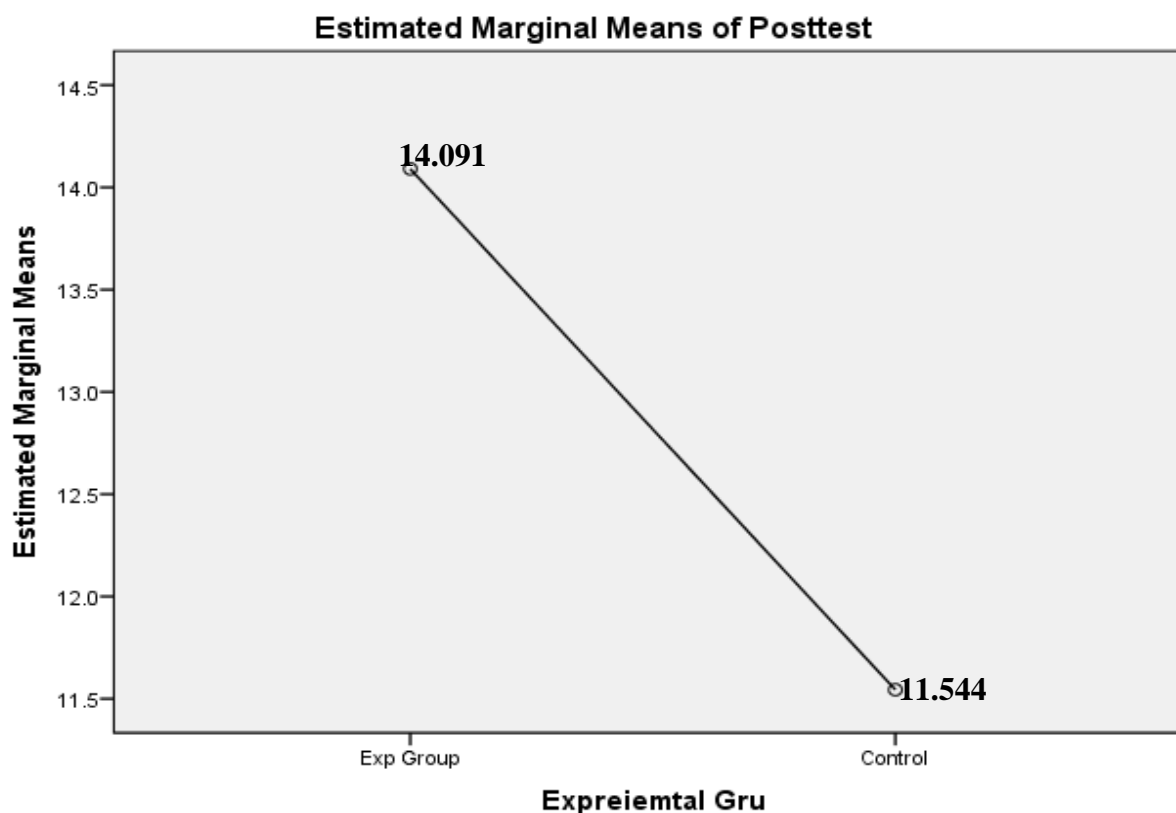
(I) Experimental Group	(J) Experimental Group	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
Exp. Group	Control	2.547*	.367	.000	1.823	3.270
Control	Exp. Group	-2.547*	.367	.000	-3.270	-1.823

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Sidak.

The result in table 5 above confirmed that the difference between the two Experimental groups (Blended instruction) and the Control Group was statistically significant. The estimated marginal mean scores was further shown in the Figure 1 below.



Covariates appearing in the model are evaluated at the following values: pretest = 9.34

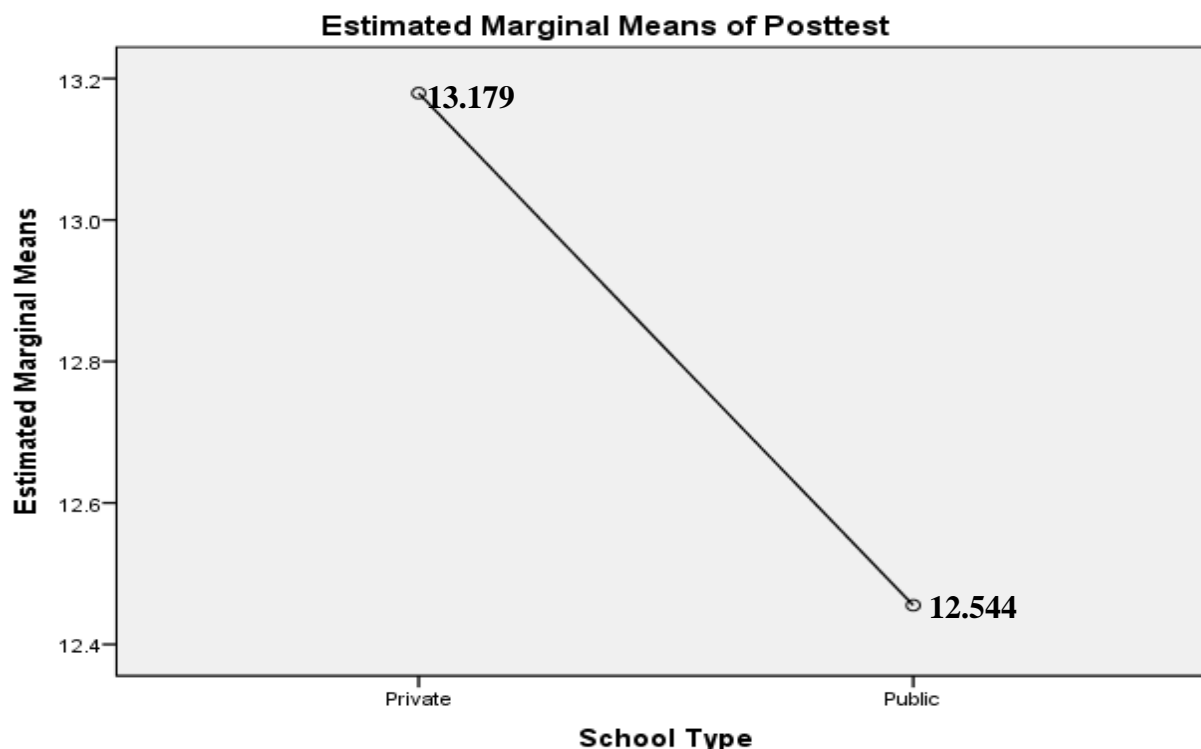
Fig. 1: Estimated Marginal Means of Performance in Biology

Results in table 3 revealed that there was significant main effect of school type on students’ performance in Biology, $F_{(1,231)} = 4.001$, $p < .05$. Therefore, the null hypothesis stated that there is no

significant effect of School type (Private and Public) on secondary school students’ performance in Biology was rejected. The partial Eta square (η^2) = .017, which means a low effect size. The implication of this is that

school type accounted for 1.7% of the variance experienced in students' performance in Biology. Figure 2 below further shows estimated marginal means of participants by school type. It was shown that participants in private school had a better mean score in

Biology (\bar{X} = 13.179) than their counterparts public school who recorded a mean score of (\bar{X} = 12.455) in Biology.



Covariates appearing in the model are evaluated at the following values: pretest = 9.34

Figure 2: Estimated Marginal Means of Participants by School Type

The result as presented in table 3 revealed there was no significant interaction effect of Treatment and school type on student's performance in Biology $F_{(1, 231)} = .004, p > 0.05$. The null hypothesis was therefore not rejected.

Discussion

The findings from the research question one of the study shows that there is a difference in the performance mean scores of Biology students taught with blended instructional approach (experimental group) and that of those taught with the conventional approach (control group) at posttest, and the experimental group has a higher mean than the control group. This results collaborate with the study of De Sousa, Richter & Nel (2017) and Inceday (2018) that teaching strategies involving multimedia use in teaching, engagement and collaborative learning such as blended learning suggests that they are better

approaches to learning more than the conventional approach. This result agrees with the findings of Sjukur (2012), who concluded that there are differences in learning outcomes between students who are taught through blended learning and those taught only through conventional learning. Consequently, Lin, Tseng, and Chiang (2014) showed students' positive responses to mathematics learning using a blended learning model. Onyenma & Abraham (2020) found out that blended learning increased the performance of students. It also corroborates the report of Peterman *et al.* (2014) and Abanikannda (2018) that students performed better when taught with blended instructional approach. In related studies, Aladejena (2009); Fakhir (2015) and Ceylan, & Kesici, (2017), similar findings were obtained.

It is revealed in this study that blended instructional approach had significant effect on the performance of students in biology. Meanwhile, the null



hypothesis that there is no significant effect of School type (Private and Public) on secondary school students' performance in Biology was rejected. This concurs with the findings of Yusuf and Afolabi (2010), who reported high performance in biology among private schools' students when taught using computer assisted instruction. It is evident in this study that private school students had better performance in biology than their public schools counterparts when taught using blended instruction.

Conclusion

The results of this study indicate that there is a significant main effect of treatment (blended and conventional instructional approaches) on students' performance in Biology. It also showed that students exposed to blended instructional approach performed better than those exposed to conventional instructional approach. Also, findings reveals that there was significant main effect of school type on students' performance in Biology. It was concluded that blended learning approach was significantly better (more effective) than the conventional method in enhancing students' performance in biology.

Recommendations

Based on the findings of this study, it is recommended that;

- i. Biology teachers in Nigerian secondary schools should use blended instructional approach to improve the performance of students.
- ii. Public schools students should be more exposed to the blended learning approach for improved performances.

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