



EFFECTS OF BLENDED LEARNING STRATEGY ON SENIOR SECONDARY SCHOOL STUDENTS' LEARNING OUTCOMES IN BIOLOGY IN EKITI STATE

BY

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Abstract

This study examined the effects of blended learning on senior secondary school students' learning outcomes in Biology in Ekiti State. Specifically, it investigated whether blended learning could improve students' academic performance and attitude towards Biology compared with the conventional teaching method. Quasi-experimental of pre-test, post-test control group design was adopted for the study. The population consisted of 5,177 Senior Secondary School Biology students in Ekiti State, from which a sample of 120 Senior Secondary School Two students were selected using a multistage sampling procedure across six schools in the three senatorial districts. Participants were divided into experimental and control groups. The experimental group was taught using blended learning strategy, while the control group received instruction through the conventional teaching method. Data were collected using two instruments: the Biology Performance Test (BPT) and the Students' Attitudinal Questionnaire in Biology (SAQB). The instruments were validated by experts, and reliability coefficients of 0.76 and 0.82 were obtained respectively using the test re-test method. Data were analyzed using descriptive statistics and inferential statistics, with hypotheses tested at the 0.05 level of significance. The findings revealed that students exposed to blended learning performed significantly better than those taught using the conventional method. However, gender had no significant effect on students' attitudes toward Biology when exposed to blended learning. The study recommended the integration of blended learning strategies in Biology teaching to promote interactive and individualized learning among secondary school students in Ekiti State.

Keywords: *Blended learning, learning outcomes, conventional instruction method.*

Introduction

Education is a well-known essential tool to empower individual and develop a nation, it may be used in intellectual, cultural, and social development of the society. Education contributes to production of needed personnel for operation at different sectors of the national economy and development processes. It is also a bed rock for human development. According to Uwazurike and Anokam in Obialor (2022), education is any act or experience that has a formative effect on the minds, character or physical ability of an individual. It is the act or process of impacting or acquiring knowledge, skills, values, belief and habit. In Nigeria, the

educational system is categorized into pre-primary schools, primary schools, secondary school and tertiary education. Secondary education plays a vital role in shaping the life of individual because it serves as a link between primary school and tertiary education. Without secondary school education, the foundation for any form of future academic aspirations cannot be laid (Abdulrahman, 2020).

The contributions of science and technology to overall development of all nations cannot be underestimated. Technology is the application of science to solve problems. Any learning that use technology or makes use of practices that

use technology is termed digital learning (blended and virtual learning). Technology has been identified as playing a critical role in the scientific advancement in the 21st century. Science encompasses the realm of human pursuit focused on providing accurate explanations for the phenomena and condition inherent in our natural surroundings, it establishes governing principles that regulate the natural world, subsequently instigating systematic and predictable event within it, as emphasized by Remi and Akujobi (2019). And for this reason, science is considered to have occupied an important position in the curriculum of Nigerian educational system. The scientific revolution that is occurring right now is being molded by developments in both science and technology.

One of the primary objectives of science education is to develop the student into a person who is capable of competing successfully on a global scale. Iroriteraye--Adjekpovu and Osimala (2020), stated that the type of teaching that is required for global learning in the 21st century is that which encourage students active participation where they learn at their own Pace, space and interact with both human and material resources to discover facts for themselves leading to meaningful learning.

Biology is one of the science subjects that is taught in secondary schools in Ekiti State, Nigeria according to the country's curriculum. It is one of the science subjects that senior secondary students offer in senior secondary certificate examinations in Nigeria (FRN, 2015). Biology is the study of living things and their vital processes. The goals of studying Biology include; providing the learner with the knowledge, skills, and mindset that are essential for enabling them to protect and conserve the environment, regulate population, fight illnesses, and increase food supply. Therefore, having a solid understanding of Biology improves grades and is a necessary precondition for a variety of exciting and varied jobs and pre-requisite to the study of courses in the fields of medical, nursing, food science, pharmacy, and other related fields (Olayinka & Ogundare, 2023). As important as Biology is, it becomes difficult to learn if not approach with the right instructional strategy.

Despite the prime position Biology occupies in our educational system, and the efforts made by researchers to enhance performance, students' performance in the

science subjects in general, and Biology in particular still fluctuating. Some of the reasons observed for the fluctuations are; ineffective instructional method, insufficient Biology teachers, inadequate laboratory, in conducive learning environment, time constraints for co-Induction of Biology practical, students attitude towards the subject, non- coverage of syllabus, and class size among others. All these are just pointing to one singular fact that, something is not right with either the quality of the subject matter or the instructional method adopted.

The performance of secondary school students in Biology in the West African Senior School Certificate Examination (WASSCE) in Ekiti State has not been encouraging, according to the findings of many studies conducted in the recent years, Biology has never achieved an exceptional score line. As a result of this, most parents, knowing that Biology is one of the prerequisite subjects to study science related courses are not happy with this development. Biology is a very important science subject and a requirement for further studies of other science related professional courses such as medicine, agriculture, pharmacy, biotechnology, genetic engineering, among others. Biology is the key to economic, intellectual, sociological, human resource development and well-being of any society.

Based on these assertions of the importance of Biology, there is need for it to be properly taught in the secondary schools to improve students' interest in the subject. It is has been observed that students' performance could be improved if new instructional approaches are adopted by secondary school Biology teachers because, exposing students to the understanding of basic concepts in Biology and achieving desirable learning outcomes requires the use of innovative and interactive instructional approach such as blended learning.

The state of teaching and learning in Nigerian secondary schools calls for review as most of the teachers in public secondary school believe in the use of the traditional talk and chalk method in the classroom. This traditional method of teaching appears to limit the extent to which students and teachers alike can move with the trend of changes in the global world.

According to recent researches, blended learning has the potential to greatly

improve students' academic performance. For instance, Osei and Amponsah, (2023) found that Students' conceptual knowledge and problem-solving abilities improved when online resources were included into traditional Biology classes. Adeyemi & Adeyemo (2022) also posited that, by offering a variety of adaptable learning resources, blended learning has the potential to fill the gaps created by the use of traditional method, to teach Biology. In few Nigerian classrooms, blended learning methodologies have been shown to demonstrate encouraging results. Hence, this study is to investigate the effect of blended learning strategy on senior secondary school students learning outcomes in Biology in Ekiti State, Nigeria.

In a study conducted by Hafeez (2021) on critical review on blended learning versus traditional lecture method, it was revealed that, in most of the studies reviewed, there were significant differences in the academic performance among students taught using blended learning and traditional approaches but blended learning proved to be more effective strategy. The findings of the study conducted by Emmanuel, Bizimana & Mutangana (2022) on performance analysis of Biology education under the implementation of lower secondary school Biology based curriculum policy implication are in alignment with that of Anari (2021) that mean achievement and change in attitude of students taught using blended learning is higher than that of their counterparts. Similarly, Adeleye and Akinnobi (2020) reported that blended learning instructional strategy was an effective strategy of teaching Biology in Ekiti State, Nigeria. Based on the results, it was suggested that teachers should adopt blended learning instructional strategy in the teaching and learning of Biology.

Ugiagben (2024) investigated the impact of blended learning on the academic performance of Basic Science students in Oredo local Government Area of Edo State, Nigeria. It was therefore concluded that, blended learning proved to be more effective in teaching and learning, and also incorporated various learning approaches that make learning more enjoyable. While several studies have examined blended learning in education, few have employed an experimental approach to determine its causal effect on senior secondary school

students' learning outcomes in Biology, particularly in Ekiti State, Nigeria. Most existing studies are descriptive or conducted at the tertiary level, leaving a gap in experimentally validated evidence at the secondary school level. This study therefore fills this gap by experimentally investigating the effect of blended learning strategy on Biology learning outcomes among senior secondary school students in Ekiti State.

Objectives of the Study

The objective of this study was to investigate the effect of blended learning strategy on senior secondary school students learning outcomes in Biology in Ekiti State, Nigeria. The study specifically:

- . Investigated the effects of blended learning strategy on senior secondary school students' performance in Biology in Ekiti State.
- ii. examined the attitude of secondary school students toward blended learning in Biology.

Methodology

The study adopted quasi-experimental pre-test, post-test control group design. The pre-test of students' performance in and attitude towards Biology were established on both experimental and control group in order to ascertain their homogeneity. Post-test was administered to measure the effect of the treatment on students' performance and attitude towards Biology. The population for the study consisted of 5,177 Senior Secondary School two (SSS II) Biology students in all 202 public secondary schools across the 16 local Government Areas (LGAs) of Ekiti State. (Source: Ekiti State Ministry of Education, Science and Technology, 2024). The sample of the study comprised 120 Senior Secondary School Two (SSS II) Biology students selected across the three Senatorial Districts in all the 16 local Government Areas in Ekiti State using multi-stage sampling procedure. The first stage was the selection of one Local Government Area (LGA) from each of the three Senatorial Districts, making a total of three Local Government Areas, using simple random sampling technique and two schools were randomly selected from each of the Local Government Areas. Second stage, purposive sampling technique was used to select four schools that have internet facilities and computer laboratories

to give room for one school from urban and rural. Students of the schools selected were assigned to the experimental and control group respectively and used as the sample for the study.

Two research instruments, Biology Performance Test (BPT) and Students Attitudinal Questionnaire in Biology (SAQB) were used to collect data for the study. The Biology Performance Test (BPT) which was drawn from West African Senior Secondary Certificate Examination (WASSCE) past questions comprised 20 questions of multiple choice questions which the respondents were asked to choose the most appropriate option as applied to them. Each correct option chosen was scored one (1) mark while each incorrect response was scored zero (0) mark. The maximum score obtainable was 20 marks.

The second instrument, Students' Attitudinal Questionnaire in Biology (SAQB) consisted of two sections, A and B. Section A sought the demographic information of the respondents such as name of school, gender and class while section B contained 20 items designed to elicit information on the attitude of students towards Biology, in 4-point Likert-type rating scale of Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points; Strongly Disagree (SD) = 1 point. The scoring was reversed for negative statements.

The instruments (BPT and SAQB) were subjected to both face and content validity. The Biology Performance Test BPT was given to two lecturers in Science Education

Department who are experts in Biology Education, two lecturers from Test, Measurement and Evaluation within Ekiti State University, Ado Ekiti, and also two experienced Secondary School Biology teachers who are NECO and WAEC examiners for scrutiny. Their corrections, comments and judgments on the clarity of questions and appropriate use of language were strictly adhered to.

The reliability of BPT and SAQB were ascertained by using test re-test method of testing reliability. This was done by administering the instruments BPT and SAQB twice, on 20 students who were not part of the sample within the interval of two weeks, a reliability coefficient of 0.76 was obtained for BPT using Pearson's Product Moment Correlation Analysis and Cronbach Alpha was used to test SAQB which yielded a reliability coefficient of 0.82. These values were regarded high enough to adjudge the instruments as being reliable.

Data Analysis

The data collected for the study were analyzed using descriptive and inferential statistics. All hypotheses generated were tested using inferential statistics. Hypotheses 1, 2, 3 and 4 were tested using t-test and tested at 0.05 level of significance.

Results

- Hypothesis 1** There is no significant difference in the pretest mean score of students in the blended learning strategy and those in Conventional group.

Table 1: t-test analysis showing the pre-test score of students' exposed to Blended learning and those taught using conventional method.

Treatment	N	Mean	S.D	Df	T	p
Blended Learning	60	43.69	4.21	118	1.266	0.083
Conventional Method	60	42.67	5.93			

$p > 0.05$

Table 1 showed that $t = 1.266$, $p = 0.083 > 0.05$. This implied that the result was not statistically significant, Therefore, the hypothesis was not rejected, implying that there was no significant difference in the pre-test mean score of students'

exposed to blended learning and those taught with conventional method. The result revealed that both groups had a comparable performance before treatment, indicating that both the experimental and control groups were homogeneous.

Hypothesis 2: There is no significant difference in the posttest mean score of students exposed to blended learning

strategy and those taught using Conventional method.

Table 2: t-test analysis showing the posttest score of students' exposed to Blended learning and those taught using conventional method.

Treatment	N	Mean	S.D	df	t	p
Blended Learning	60	77.58	10.23	118	5.569	0.035
Conventional Method	60	68.00	8.55			

* $p < 0.05$

Table 2 showed that $t = 5.569$, $p = 0.035 < 0.05$. This implied that the result was statistically significant. The hypothesis was therefore rejected, which means that students taught with Blended Learning performed better compared to

those taught with conventional method after treatment.

Hypothesis 3: There is no significant difference in the attitudinal pretest mean score of students towards blended learning strategy and those in Conventional method

Table 3: t-test analysis showing the attitudinal mean score of students' exposed to Blended Learning and Conventional method before treatment in Biology.

Treatment	N	Mean	S.D	df	t	P
Blended Learning	60	59.45	7.64	118	4.336	0.795
Conventional Method	60	53.28	7.94			

$P > 0.05$

Table 3 showed that $t = 4.336$, $p = 0.795 > 0.05$. This implied that the result was not significant. Therefore, the hypothesis was not rejected, implying that there was no significant difference in the attitude of students towards Biology when exposed to blended learning and conventional method before treatment

indicating that both groups had comparable attitude towards learning of Biology.

Hypothesis 4: There is no significant difference in the attitudinal posttest mean score of students towards blended learning strategy and those taught using Conventional method.

Table 4: t-test analysis showing the attitudinal mean score of students' exposed to Blended Learning and Conventional Method after treatment in Biology.

Treatment	N	Mean	S.D	df	t	P
Blended Learning	60	80.87	10.11	118	2.736	0.004
Conventional Method	60	67.48	6.42			

* $p < 0.05$

Table 4 showed that $t = 2.736$, $p = 0.004 < 0.05$. This implied that the result was significant since. Therefore, the hypothesis was rejected, suggesting that Blended Learning Strategy have more effect on the attitude of students towards Biology compared to conventional method.

Discussion

The findings of this study revealed that there was no significant difference in the pre-test performance of students in both the experimental and control groups indicating a comparable baseline academic performance. This established the homogeneity of the two groups involved in the study prior to the treatment. This implied that the knowledge baseline of the two groups involved in the study were equal. This outcome aligned with the opinion of Creswell and Creswell (2023), who emphasized that establishing equivalence between groups prior to an intervention is essential for attributing post-test differences to the teaching method rather than pre-existing disparities. The similarity in baseline performance suggests that careful grouping effectively controlled for initial academic ability, thereby strengthening the internal validity of the study. This ensured that any subsequent differences recorded afterwards can be confidently linked to the treatment applied. In other words, the difference in the performance and attitude recorded was as a result of treatment applied.

The finding of this study also revealed that blended learning strategy significantly enhanced students' academic performance in Biology compared to the conventional method, as evidenced via the higher mean gain. This suggests that blended learning strategy stimulated students to work collaboratively and productively and enhanced the appeal of the educational activities in the blended learning environment. This result aligned with the finding of Al-Sumaeri (2024) that blended learning strategy enhances academic achievement, motivation and improves students' academic and cognitive performance. The improvement could be attributed to the flexibility nature of blended learning which allows students' to learn at their own pace, space and as well interact

Recommendations

Based on the findings of this study, the following recommendations were made:

with both human and material resources leading to meaningful learning outcomes. Similarly, the finding corroborated that of Tashtoush (2023) who reported significant differences in students' learning outcomes in mathematics and physics before and after the implementation of blended learning. This implied that blended learning can improve academic performance and significantly increase motivation in students.

Furthermore, this finding was also in line with the finding of Adewoyin and Yusuf (2020) who reported that students taught using blended learning strategy performed significantly better than those taught using the conventional method. The improvement was linked to the use of online discussions, and opportunities for independent learning. Similarly, Ogunleye (2019) found that blended learning enhanced students' conceptual understanding of Biology concepts, leading to improved post-test scores compared with pre-test. These findings contradict the hypothesis which states that there is no significant difference in the performance of students exposed to blended learning and those taught using the conventional method.

In addition, the study revealed that the students exposed to blended learning strategy demonstrated a predominantly positive attitude towards Biology as indicated by high percentage in Students' Attitudinal Questionnaire in Biology (SAQB) compared to those taught using conventional method. This implied that students exhibit enjoyment, satisfaction, engagement and confidence in Biology through self-learning. This was in line with the findings of Enwemasor & Charles-Odili (2022), they found that blended learning significantly improved students' attitude towards Biology by promoting collaboration, continuous feedback, and meaningful engagement.

Conclusion

From the findings of this study, it could be concluded that, blended learning strategy was more effective and reliable method of instruction that enhances better performance of senior secondary school students, and improve their attitude towards Biology than Conventional method.

- i. Biology teachers should make use of blended learning strategy to improve their students'

- learning outcomes regardless of gender.
- ii. Blended learning strategy should be incorporated formally into the senior secondary school Biology curriculum as a recognized method of teaching various concepts in Biology
 - iii. Students should cultivate the habit of learning at their own pace with flexible time and space which will assist during Blended learning instruction.
 - iv. Ministry of education and school administration should organize seminars and workshops for Biology teachers on how to adopt the use of blended learning strategy in teaching Biology.

REFERENCES

- Abdulrahman et al. (2020) Multimedia tools in the teaching and learning process: A systematic review, *Educational Review Journal*. 6 (11) e05312.
- Adeleye, A.M & Omotayo, K.A (2020) .Effects of Spaced and Blended learning on senior secondary school students' interest in Biology in Ekiti State. *Euro Afro Studies international Journal*, 1(5)11-22
- Adeyemi, A., & Adeyemo, T. (2022). Blended learning: A solution to educational gaps in Nigeria. *African Journal of Educational Research*, 15(3), 112-128.
- Anari, M. I. (2021). Blended Instructional Strategies and Performance of Senior Secondary II Students in Chemistry. *Inter-Disciplinary Journal of Science Education*, 3 (1), 57-67.
- Bizimana, E., Mutangana, D., & Mwesigye, A. (2022). Effects of Concept Mapping and Cooperative Mastery Strategies in Students' Achievement in and Attitude towards Instructional Strategies. *International Journal of Learning, Teaching and Educational Research*, 21(2), 107-132
- Enwemasor, B.C., & Charles-Odili V.N. (2022). Integration of blended learning as a measure for facilitating instruction in the tertiary business education programme in the new normal in Delta State. Nigerian Journal of Business Education, 9(2), 13-21.
- Creswell , J. W., & Creswell, J. D. (2025). *Research Design; Qualitative, quantitative, and mixed method approaches*, (6th edition) Sage Publication.
- Federal Republic of Nigeria (FRN, 2014) National Policy on Education (6thEdition). Lagos, NERDC press.
- Hafeez M. (2021) A critical review on blended learning versus traditional lecture method. *International Journal of Learning and Teaching*, 13 (2), 62-76.
- Iroriteraye-Ajekovu, J.I. & Osimala, E.A. (2020) Effective digital audio-teaching technology. A tool for restructuring Basic Science and Technology Education for sustainable growth, development and global relevance. *DELSU Journal of Educational Research and Development (DJERD)* 17(2), 73-78.
- Obialor, C.O., (2018) The place of Science Education in National development and factors affecting its effectiveness, 20(1) 319-331.
- Ogunleye, B.O. (2019).Technology- based instruction and students' performance in Biology. *Journal of Science Education*, 10(3), 134-142.
- Osei, R., & Amponsah, J. (2023).Blended learning and conceptual knowledge acquisition: A case study in science education. *African Journal of Science Education*, 9(2), 56-72
- Remi, O.,& Akujobi, T. (2019).The role of science education in national development. *Journal of Science and Society*, 14(3), 45-60.
- Smith, R., & Brown, L. (2021).The rise of blended learning: Its impact on educational outcomes. *Journal of Educational Technology & Society*, 24(2), 123-140.
- Tashtoush, M. A. , Wardat, Y., & Elsayed, A.M. (2023). Mathematics distance learning and loss during COVID-19 pandemic: Teachers' perspectives. *Journal of Higher Education Theory and Practice*, 23 (5), 162-174