

**THE USE AND EFFECT OF BLENDED LEARNING TEACHING STRATEGY ON STUDENTS'
ACADEMIC PERFORMANCE IN SENIOR SECONDARY SCHOOL BIOLOGY IN ONDO
WEST LOCAL GOVERNMENT AREA OF ONDO STATE**

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Abstract

This study investigated the use and effect of blended learning on students' academic performance in senior secondary school Biology. Pre-test post-test control group in quasi-experimental research design was adopted for the study. Intact classes comprise of senior secondary school two science students was drawn from two public secondary schools in Ondo West Local Government Area of Ondo State was used for the study. Data were collected through the use of is Biology Achievement Test (BAT) which was self-developed by the researcher. Data collected were analysed using t-test analysis. The study revealed that there was no significant difference between the pre-test of students taught with blended learning and those taught with conventional instructional strategy. The study revealed that there was a significant difference in the achievement of students that were taught with blended learning and those taught with conventional method. The study showed that there was no significant difference in the post-test achievement scores of male and female students taught with blended learning. The study recommended that seminar and workshop should be organised for teachers on other effective teaching strategies such as blended learning in the teaching and learning process. The use of blended learning as instructional strategy for effective teaching and learning process should be included and clearly indicated in the curriculum of trainee teachers. Government and professional associations should organise seminars, workshops, symposia and in-service training to update the knowledge of their members on the implications of the use of blended learning on the students learning outcomes.

Keywords: Blended Learning, Diagnosis, Retention, Performance, Biology

Introduction

Science has been regarded as the bedrock of where modern-day technological breakthrough is built. Nowadays, countries all over the world especially the developing ones like Nigeria are striving hard to develop technologically and scientifically, since the world is turning scientific and all proper functioning of lives depend greatly on science. Science is a dynamic human activity concerned with understanding the workings of our world. This understanding helps man to know more about the universe. Science comprises of the basic disciplines (subjects) such as Physics, Chemistry, and Biology.

Biology has a very high enrolment of students in the external examination (Senior School Certificate Examination) more than Physics and Chemistry. Regardless of the high number of students' enrolment in Biology in the senior school examinations conducted by West African Examination Council (WAEC) and National Examination Council (NECO), reports from scholars and educators (Ige, 2009; Opara, 2011) indicated that students' achievement in Biology in the external examinations is poor.

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Academic performance is a term used to describe the rating of a student following an examination. This is an important aspect of student's life and is known to be influenced by various factors including anxiety and level of hard work/preparation done prior to the examination (Adejare, 2009). Balogun (2011) opined that academic done performance is measured by the standing rates of grades of students in every subject and student have their own attitude towards learning and achieving a high level of academic performance.

However, academic performance of learner has attracted attention of scholar, parents, policy-maker and planners. For example, Adeyemo (2001) opined that the major goal of the school is to work toward attainment of academic excellence by student. According to Adeyemo (2001), the school may have other peripheral objective: emphasis is always placed on the achievement of sound scholarship. Besides, virtually everybody concerned with education places premium is places on academic achievement and excellent academic achievement of children is often the expectation of parents (Osiki, 2001). This implies that high premium is placed on student's academic and achievement in Nigeria. In view of this, students are expected to attain high academic achievement considering the fact that attained level of academic achievement server as parameter for class promotion, recruitment, placement and advancement in both public and private sector organizations and more importantly, for admission into tertiary institutions and colleges (Okoiye, 2011).

The teaching of Biology without using the appropriate teaching strategy will certainly result to lack of motivation on the part of students to comprehend and subsequently lead to their poor performance. This calls for effective teaching of Biology topics with the use of appropriate strategy that will increase students' academic achievement. In teaching Biology in our secondary schools, the teacher should be able to carry out physics lesson with the activities that are meaningful, fun and interesting for the learners (Pedersen et al., 2016).

The conventional/traditional teaching methods involve unidirectional flow of information/knowledge from teacher to the students and do not encourage process skill acquisition needed for proper understanding of biological principles, concepts and facts. Guisti (2008) referred to these traditional teaching methods as teacher-centred approaches to learning in the sense that the teacher and those up in the educational hierarchy are considered as the possessor of knowledge to be

transferred to the students, and as such decides how the knowledge transfer takes place. The unidirectional flow of information in the traditional teaching method makes students passive and unable to construct meaningful knowledge in the teaching and learning of Biology.

The shortcomings of these traditional teaching methods resulted to the persistent search for an effective method of teaching and learning Biology which culminated to the discovery and suggestions by some researchers (Nwagbo, 2006; Akpan 2010), for the use of innovative teaching methods such as inquiry method, concept mappings, simulations and games, constructivism, problem based learning etc.

The innovative methods are considered as effective teaching methods that can improve on students' achievement and interest in Biology. The innovative teaching methods are activity-based and characterized by students sharing some degree of responsibility for making decision in the learning process. In the innovative teaching methods the teacher is often described as a partner and a facilitator in the teaching and learning process and not the possessor of knowledge hence the innovative teaching methods are referred to as student-centred approach to learning. (Campbell, 2006).

The teaching of Biology without using the appropriate teaching strategy will certainly result to poor performance in the course. This calls for effective teaching of Biology topics with the use of appropriate strategy that will increase students' academic achievement. In teaching Biology in our secondary schools, the teacher should be able to carry out Biology lesson with the activities that are meaningful, fun and interesting for the learners and this could be achieved through the use of blended learning.

According to Graham (2013), blended learning refers to systems that combine face-to-face instruction with computer mediated instruction. Bluic, Goodyear and Ellis (2007) defined blended learning as learning activities that involve a systematic combination of co-present (face-to-face) interactions and technologically-mediated interactions between students, teachers and learning resources. This online technology-based learning involves mixing various event-based activities such as face-to-face class room, live e-learning, self-paced learning, synchronous online conference and training, or synchronous self-pace learning (Graham, 2013; Wang, 2011). Blended learning offers

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students opportunities to learn at their own pace. Also, lesson delivery, learners' performance and report monitoring can be done by the teacher through the use of e-learning.

However, blended learning is not simply to replace the conventional learning with integration of ICT. A blended learning instruction should be representing for fundamental in conceptualizing and reorganizing for dynamic teaching and learning to incorporate various teaching components such as online learning, face-to-face learning, media for learning contents, synchronous and asynchronous interaction, different of teaching materials and activities for groups or individuals (Hoic-Bozic, Mornar, and Boticki, 2009).

The unique feature of blended learning is the ability to use refined techniques from both e-learning and traditional method to produce an output which is the best of each method (Almasaed, 2014). The interactions involve face to face and online processes, integrated in such a way that the strengths of each blends into unique learning experience that is congruent with the context and the intended outcome. There are numerous advantages of blended learning in teaching and learning of science. According to Alsahhi, Eltahir and Al-Qatawneh (2019), blended learning reduces educational costs, increases the number of subjects learned, helps students strive further in particular subjects and allows teachers greater one-on-one relationships with students. Furthermore, blended learning provides scientific materials to student in a fast, easy and clear manner from various forms of e-learning. It makes group lecturing possible and each student can advance at their own pace.

Hence, this study adopted the use of blended learning as a medium of instruction in teaching and learning in secondary schools that this study was conceived. It is an attempt to establish through a statistical model the impact of ICT facilities such as computers on effective teaching and meaningful learning of Senior School Certificate (SSC) Biology.

Objectives of the Study

1. Examine the use of blended learning and its effect on the students' achievement in Physics.
2. Determine the effectiveness of blended learning on students' achievement in Biology as compared to conventional methods of instruction like demonstration, lecture, questioning and so on.

3. Determine the effect of blended learning on knowledge comprehension and application components of the cognitive domain.
4. Find out attitude of the experimental group students towards Computer Assisted Instruction Teaching Strategy after being carried out.
5. Ascertain the possibility of introducing blended learning into secondary schools.
6. Develop software for blended learning in the content area of secondary level Biology that will bring about meaningful learning, students' interest, and enhanced achievement.

Method

The population of the study comprised all Senior Secondary School Biology students in all the secondary schools in Ondo West Local Government Area of Ondo State. A sample of fifty (50) SSII students from two (2) secondary schools in Ondo West Local Government Area of Ondo State was used for the study. The students and schools (St. Andrew's Grammar School, Ondo and St. James' Grammar School, Ondo) were randomly selected from the numerous secondary schools in the Local Government Area. The rationale for the sample was based on the fact that the SSII students have chosen Biology as one of their Senior Secondary School Certificate Examination (SSCE) subject combinations, and had acquired some conceptual understanding of Biology.

The SSIII students were not sampled because they have just concluded their final year SSC examinations. In the same vein, the SS1 students were also not considered because they were new in the senior secondary school system with little exposure to learning of Biology.

Research Instruments

Two research instruments were used for this study. A projected computer assisted instruction (power-point presentation) that contained a computer assisted instruction (CAI) program in the learning content areas of the selected topics in SS2 Biology was developed and used to teach and diagnose the students. Biology Achievement Test (BAT) was also developed by the researchers and used as a post test. Hence, BAT comprised twenty five (25) fill-the-gap objective test items on motion, mechanical energy and waves. These test items were based on the test materials

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included in the CAI program. A comprehensive table of specification (blue print) for the test was framed. Cells in the two-way chart of specification gave the details of number of test items by content and instructional objectives worked out by the researchers. The instruments were thoroughly validated through the assistance of two experts in Test and Measurement of Adeyemi College of Education, Ondo.

To investigate the use and effect of blended learning teaching strategy on students' achievement in Biology, an experimental study was conducted. Two-matched groups of 25 students each were taken to conduct the experiment. Blended Group (BG) students received treatment in the form of CAI while the Conventional Group (CG) students received instruction through the conventional method of teaching.

Biology Achievement Test (BAT) administered as a post-test to both groups, did not only give total achievement scores of the students but also the sub-table of achievement with respect to objectives and content area. Paired t-test was employed to compare the achievement scores of the BG and CG students on BAT.

Emerging results were tabulated for brevity and clarity of interpretation with respect to the effects of blended learning on students' achievement in SSC Biology. Findings of earlier research works were considered in consonance with the emerging results of this study.

Table 1: Pre-test achievement scores of students taught with blended learning and conventional instructional strategy.

Group	N	Mean	St. D.	df	t_c	t_t	Remark
Blended	25	38.88	7.776	48	0.2196	2.021	Not significant
Conventional	25	38.40	7.679				

$t_t(df = 48, p = 0.05) = 2.021$

Since t-calculated value ($t_c = 0.2196$) is less than the t-table value ($t_t = 2.021$) i.e. $t_c < t_t$, therefore, the null hypothesis is accepted. This shows that there was no significant difference between the pre-test of students taught with blended learning and those taught with conventional instructional strategy.

Results

The basic purpose of the study was to examine the use and effect of blended learning teaching strategy on students' achievement in Senior School Certificate Biology. Data were collected on a post-test called an achievement test which served as one of the instrument for the research.

The study used Biology Achievement Test (BAT) as a pre-test and post-test to measure students' achievement in the three (3) levels of cognitive domain i.e. knowledge, comprehension and appreciation. Analysis of data was done to compare both the experimental and control groups on the basis of overall achievement by levels of cognitive achievement. Hence, t-test was used in the statistical analysis of the collected data.

Hypotheses Testing

H₀₁: There is no significant difference between the pre-test scores of students taught with blended learning and those taught with conventional instructional strategy.

This null hypothesis was tested using the Senior Secondary School II (SSS II) Biology students. The table below shows the pre-test achievement scores of students taught with blended learning and conventional instructional strategy.

H₀₂: There is no significant difference in the achievement of students that were taught with blended learning and those taught with conventional method.

This null hypothesis was tested using the Senior Secondary School II (SSS II) Biology students. The table below shows the achievement of students that were taught with blended learning and those taught with conventional method.

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Table 2: Achievement of students that were taught with blended learning and those taught with conventional method

Group	N	Mean	St. D.	df	t_c	t_t	Remark
Blended	25	72.48	14.496	48	3.723	2.021	Significant
Conventional	25	58.60	11.719				

$t_c(d_f = 48, p = 0.05) = 2.021$

Since t-calculated value ($t_c = 3.723$) is greater than the t-table value ($t_t = 2.021$) i.e. $t_c > t_t$, therefore, the null hypothesis is rejected. This shows that there was a significant difference in the achievement of students that were taught with blended learning and those taught with conventional method.

H₀₃: There is no significant difference in the post-test achievement scores of male and female students taught with blended learning.

This null hypothesis was tested using the Senior Secondary School II (SSS II) Biology students. The table below shows the post-test achievement scores of male and female students taught with blended learning.

Table 3: Post-test achievement scores of male and female students taught with blended learning

Group	N	Mean	St. D.	df	t_c	t_t	Remark
Male	9	71.56	23.852	23	0.169	2.069	Not significant
Female	16	73.00	18.249				

Since t-calculated value ($t_c = 0.169$) is less than the t-table value ($t_t = 2.069$) i.e. $t_c < t_t$, therefore, the null hypothesis is accepted. This shows that there was no significant difference in the post-test achievement scores of male and female students taught with blended learning.

Discussion and Educational Implications

The study showed that there was no significant difference between the pre-test of students taught with blended learning and those taught with conventional instructional strategy. This revealed that there was no difference in the academic achievement of students in Biology before they were exposed to blended learning and conventional instructional strategies. The students from both the blended and conventional groups had the same academic achievement. The study revealed that there was a significant difference in the achievement of students that were taught with blended

learning and those taught with conventional method. This implies that there was a difference in the achievement of students that were taught using blended learning in the experimental group and those taught with conventional method in the control group. This shows that the use of blended learning has positive effects on the students' achievement in biology because it facilitated meaningful learning and conceptual understanding of the learning contents for greater retention by the Biology students. Hence, the students displayed a greater mean ($x = 72.48$) in their biology achievement test (BAT) scores.

The study showed that there was no significant difference in the post-test achievement scores of male and female students taught with blended learning. This implies that both male and female students performed equally in the post-test achievement scores using blended learning in the experimental group. This might be due to the fact that the

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use of blended learning catered for both male and female students and they understood the learning contents in biology as blended learning facilitated learning.

Conclusion

The result of this study showed the effect of blended learning on students' achievement in Biology. Learning with blended learning strategy could promote effective and efficient teaching, meaningful learning and greater retention of biological concepts and processes. Adoption of blended learning strategy as an instructional method of teaching Biology is more likely to enhance academic interest, reduce examination malpractice, promotes good health and sustained better attitude toward learning of Biology beyond the classroom situations.

The increased students' achievement can provide sound and capable candidates for science and technology courses as well as component and responsible manpower to improve humanity and environment. It is envisioned that most students' interest and ability to acquire and apply biological and scientific knowledge to everyday life could improve the nation's scientific and technological development. This is intended to bring about sustainable manpower as well as reliable security measures for a dynamic society.

Recommendations

The finding from this study has shown that blended learning strategy as a method of teaching Senior School Certificate (SSC) Biology will go a long way to creating a conducive atmosphere for effective teaching and meaningful learning. It is, therefore, recommended that teachers at all levels of education should adopt blended learning strategy as a method of teaching.

Seminar and workshop should be organised for teachers on other effective teaching strategies such as blended learning in the teaching and learning process. The use of blended learning as instructional strategy for effective teaching and learning process should be included and clearly indicated in the curriculum of trainee teachers.

Government and professional associations should organise seminars, workshops, symposia and in-service training to update the knowledge of their members on the implications of the use of blended learning on the students learning outcomes.

Government at all levels should provide adequate learning resources for the secondary school students particularly schools in the rural areas in Ondo State.

This study was limited to Biology alone. Interested and prospective research students can improve on this study and determine the effect of blended learning strategy as a teaching method on other subjects in science, social sciences, humanities and arts. The tendency is to enhance productive and participatory learning for greater students' academic interest and achievement. In the nearest future, eradication of examination malpractices and mass failure in the school subjects could produce qualitative education and more responsible citizens.

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