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Effect of Blended Learning Approach on Biology Students' Achievement in Ose Local Government Area of Ondo State, Nigeria

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Abstract

This study investigated the effect of blended learning approach on Biology students' achievement in Ose Local Government Area of Ondo State, Nigeria. The study adopted the pretest-posttest non-equivalent control group research design. The population of this study comprised all the 516 SSS II Biology students in public co-educational schools in Ose Local Government Area of Ondo State. The sample of this study comprised all the 58 students from two intact classes selected. Two research questions were raised and all were hypothesized and tested to guide the direction of the study. The Biology Achievement Test (BAT) instrument comprising 30-items objective questions was used to collect data for the study. The instrument was validated by experts in the Department of Curriculum and Instructional Technology, Faculty of Education, University of Benin. The BAT was trial tested on 20 students outside the sample area. The Pearson Product Moment Correlation Coefficient statistic was deployed to obtain a reliability co-efficient of 0.750. The data collected were analyzed using mean, standard deviation and ANCOVA statistics at 0.05 level of significance. It was found among others that there is no significant difference in achievement between students taught Biology with blended learning approach and traditional method. It was recommended among others that Workshops and seminars should be organized by states' ministry of education for secondary school teachers on how to use Blended learning approach in teaching biological concepts. Secondly, Provisions should be made by local school authority and state government for computers, internet and power generating facilities that would enable teachers to adopt and students to learn using the blended learning approach.

Keywords: Blended learning, Traditional method, Achievement

Introduction

Biology is a branch of natural science that deals with the study of living organisms. This includes their structures, functions, evolution, distribution and interrelationships. Biology occupies a unique position in the secondary school education curriculum because of its importance as a life science. In Nigeria, the secondary school Biology curriculum is designed to continue student investigation into the natural phenomena, to deepen students' understanding and attitude towards biological sciences and also to encourage students to apply scientific

knowledge to everyday life in matters of persons, community, health and agriculture. The knowledge of Biology have been crystalized into concepts, empirical laws and theories which form the basis of our material comfort. Biology as a very important science subject, stands as the bedrock upon which are based many other science courses/careers like Medicine, Pharmacy, Nursing, Biochemistry, Genetic and Agriculture, which are of great economic importance to a nation. Besides, in this 21st century, as the nation expect better health for all, abundant food for all, better knowledge of man, animals and plants and less polluted environments with sulphur (iv) oxide and radioactive substances are expected, there is the need to effectively teach and learn Biology to meet the impending challenges.

Teaching approaches employed by teachers are one of the most important areas that researchers have put their searchlight. This is because it can easily be manipulated to bring positive changes in learners. Teaching is a process of impacting knowledge which involves many activities on the part of the teacher and the learners (students). Teaching approaches includes the various means and activities of the teacher and learner in the learning process geared towards acquiring ideas, knowledge, skills and values that are built within the educational aims and objectives. According to Al-Quisi (2015) teaching approachs are set of performances that the teacher uses to achieve expected behavior among learners. Adunola (2011) added that in order to bring desirable changes in students the teaching approach used by teachers should be best for the subject matter explaining that teaching approach work effectively mainly if they suit learners' needs; teaching approachs are one of the components of the curriculum. Based on the above, a teaching approach can be defined as the description of learning objectives, oriented activities and the flow of information between teacher and students in the teaching and learning process.

Teacher-centred approach includes all the teaching methods in which the teacher dominates in the lesson procedure and takes the lead in coordinating the classroom activities as regards to what to be done. According to Mascolo in Serin 2018 the teacher-centered approach refers to communication of knowledge to students in a learning environment in which the teacher takes the primary responsibility; teachers are active while students are passive. This approach emphasizes and encourages memorization. The term teacher-centred approach therefore comes from the roles of the teacher in the traditional classroom as the teacher is the possessor of knowledge and decision maker and also decides the knowledge that will be transferred to learners in the teaching learning process. Hassen (2015) asserts that the most important reason for academic failure is the use of teacher-centered approach which turns some students or all of them into passive learners. In addition, the use of teacher-centred approach has received so much criticism for not creating an environment in the classroom to develop critical thinking, problem solving skills and exchange of ideas among students (Ganyaupfu 2013; Carter 2016; Muema, Mulwa, and Mailu 2018). For that reason, there is a shift from teacher-centered approach towards student-centered approach in classroom instruction

Student-centred approaches include all teaching methods that underscore the teacher as a decision maker and problem solver in the classroom but rather see the teachers as guides, facilitators, mentors, coach or consultants in the teaching and learning process. The term student-centred, child-centred or learner-centred are interchangeably used to refer to teaching methods that allow students to share some degree of responsibility and decision making

in the classroom. Student-centred approach is grounded in constructivism, with the epistemological view that learners are the architects of their own idiosyncratic meaning of concepts and natural phenomena. However, Campbell (2006) posited that the cognitive learning theory also advocates for student-centred idea. In discussing student-centred teaching approach, such terms like constructivism, inquiry and discovery learning are often interchangeably used. Nevertheless, in today's educational discussions, the term student-centred approach is a broad term that includes all innovative teaching methods that are usually activity oriented, where learners are expected to observe, analyze, synthesize and evaluate ideas or phenomena using materials or previous knowledge. Teaching methods emphasizing this approach include discovery, constructivism related method (concept mapping, co-operative learning), problem solving, graphic organizers, annotated diagrams, flipped classroom, role playing, simulations, blended learning, inquiry method and games. The student-centred approach is relevant to Biology teaching because it creates an environment that will encourage students to interact with materials and specimens that enable students to construct meaning, knowledge and learn Biology from first-hand experience. It may be for this reason that, Daluba (2013) opined that for better performance of students, there is the need for activity simulating and student-centered approach like demonstration method instead of depending on the conventional approach like lecture method. Student-centered approaches which are more effective should be more encouraged because they embrace the concept of discovery learning (Brindley, 2015).

Blended learning is one of such student centred learning methods that can be utilized in the teaching and learning of Biology. Blended learning has been defined in a number of ways and a generally accepted definition does not exist. It is used interchangeably with distance learning, online learning, e-learning, blended teaching, e-teaching, blended e-learning, hybrid learning and flexible learning. Literature defines blended learning in many different ways according to instructional method. There are three most common definitions documented by Graham, Allen and Ure (2005) under the following three headings: Combining instructional modalities, Combining instructional methods and Combining online and face-to-face learning. According to Skill and Young (2002), blended learning is a combination of in-class teaching and learning modalities with robust electronically mediated experiences. Singh (2003) sees blended learning as a combination of multiple instructional methods designed to complement each other and promote meaningful learning. Combining online and face-to-face learning according to Welker and Bernardino (2006) is the use of electronic learning tools that supplement but do not replace face-to-face learning. These definitions connote instructional systems that combines multiple delivery methods, that is face-to-face classroom with asynchronous online learning. The broad nature of these definitions stands as critics however, Oliver and Trigwell (2005) attacked the concept as ill-defined and eventually different understandings began to emerge.

Krasnova (2014) posited that blended learning is a method of teaching that combines the most effective face-to-face teaching techniques and online interactive collaboration, both constituting a system that functions in constant correction and forms a single whole. Also Staker and Horn (2015) defines blended learning as a formal educational program in which a student learns at least part through online delivery of

content and instruction with some element of student control over time, place, path, or pace and at least in part at a supervised brick-and-mortar location away from home. Balentyne and Varge (2017) viewed Blended Learning as an instructional strategy that involves a thoughtful combination of traditional face-to-face instruction and online instruction. Their definitions emphasized more on content and instruction that must be delivered online, meaning that a traditional face-to-face course in which students are encouraged to use the internet for research does not qualify as blended learning. In addition, blended learning courses can support students and has been proved to be very useful in improving teacher's abilities to respond to a wide range of students' need.

Gender is a sociocultural construct ascribing some characteristics and roles of sex such as male and female within the society. The concept of gender is equivalent to class and race and many social construct just as class and race (Roberts, 1996). Okeke (2007) observed that the circumstances of gender have strongly interacted with culture to produce sex role – stereotypes which cut across social, economic, political and educational development especially in the areas of science and technology. Also. Oludipe (2012) observed that in Nigeria, certain vocations and professions have traditionally been regarded as men's (medicine, engineering and architecture) and others as women's (nursing and catering, typing). Nevertheless, recent studies reported that although there is a decrease in the gap in gender difference in students' performance in science, female representation in sciences is still low in comparison with their male counterparts. Gender issues and its effects on students' academic achievement in science has persisted over the years with contradicting results and it stands out as a controversial issue in science education due to varying reports from different researchers. Researchers like Okoro, 2011; Gipps, 2014; and Kingdon, 2015 are of the view that males perform better than females in sciences while Calsambis, 2014 and Soyibo, 2014 found females better, whereas some other researchers like Oludipe 2012; Achor, Wude, & Duguryil, 2013; Ventura, 2013 and Ajayi & Ogbeba, 2017 are of the view that both male and females achieve equally in science when given equal opportunity and facilities.

Despite the enormous importance of Biology to mankind and the nation, the teaching and learning of Biology as a discipline has been characterized by poor academic performance over the years. This could be attributed to the continuous use of the traditional teaching method which does not give room for active participation and improvement in academic achievement of Biology students in the subject. Several factors have been identified as could also be responsible for this poor performance in Biology which includes teachers choice of instructional strategy, use and non-use of instructional materials, students' study habit, teachers' qualification and training, and so on. Several studies have been carried out to ascertain the effectiveness of blended learning approach in Nigeria and beyond. For instance, Khaled (2013) used blended learning on developing critical thinking skills and found no statistically significant difference between the pre-measurement and post-measurement in the experimental group in Saudi Arabia. Also, Ezeanyika and Okigbo, (2021) studied the effect of Blended Learning Instructional Approach on Secondary School Students' Academic Achievement in Computer Studies in Awka, Anambra state of Nigeria. The findings of the study revealed among others that there is a significant difference between the mean academic scores of the students taught computer studies using blended learning instructional approach and those taught using conventional method in favour of blended

learning. In another study, Okoro (2011) investigated interactive learning patterns on achievement and interest in Biology and found that gender differences existed in the achievement and interest of students in favour of male students who achieved more than the females in Enugu State. However, none of the above studies highlighted have been carried out in Ose Local Government Area of Ondo State. Also, none of these studies have considered the variables of blended learning, gender and achievement in a single study. It is on this note, that this study investigated the effect of blended learning approach on Biology students' achievement in Ose Local Government Area of Ondo State, Nigeria.

Purpose of the Study

The purpose of this study is to determine the effect of blended learning approach on Biology students' achievement in Ose Local Government Area of Ondo State, Nigeria. Specifically, this study:

1. ascertained the difference in academic achievement between students taught Biology with blended learning approach and traditional method,
2. investigated the difference in male and female students' academic achievement in Biology after treatment using blended learning approach.

Hypothesis

$H0_1$: There is no significant difference in the achievement between students taught Biology with Blended learning approach and students taught with traditional method.

$H0_2$: There is no significant difference in male and female students' achievement in Biology after treatment using Blended learning approach.

Method

This study utilized the pretest-posttest non-equivalent control group research design. The population of this study is 516 SSS II Biology students in public co-educational schools in Ose Local Government Area of Ondo State. The simple random sampling was used to obtain two schools for this study. A total of fifty-eight (58) students which comprises thirty-three males and twenty-five females from two intact classes were sampled for the study. The Biology Achievement Test (BAT) which was made up of thirty (30) multiple choice objective question items was utilized for data collection in this study. The instrument was validated by experts in the Department of Curriculum and Instructional Technology, Faculty of Education, University of Benin, Edo State. The reliability was ascertained using the test-retest reliability technique and the Pearson Product Moment Correlation statistic was used to obtain a reliability coefficient index of 0.75 before it was put to use.

Results

Research Question One: What is the difference in academic achievement between students taught Biology with blended learning approach and traditional method?

Table 1: Mean and Standard Deviation Showing Achievement in Blended and Traditional Methods

Groups	N	Mean ($\bar{X}$)	Standard Deviation
Blended Learning	25	13.32	4.230
Traditional Method	33	16.15	4.177

The results in Table 1 show the mean scores for achievement for the experimental and control group. The data shows that the blended learning group means score was 13.32, a standard deviation score of 4.230. While for the control group, the participants' mean score of 16.15, a standard deviation of 4.177. The results show that the control group got a higher mean score after treatment.

Research Question Two: What is the difference in male and female students' academic achievement in Biology after treatment using blended learning approach?

Table 2: Mean and Standard Deviation Showing Achievement of Male and Female Students Taught Biology Using Blended Learning Approach

Groups	N	Mean	Standard Deviation
Male	10	15.50	4.577
Female	15	11.87	3.399

The results in Table 2 show the mean scores for posttest achievement for males and female in the experimental group. The data shows that male participants got a mean score of 15.50, and a standard deviation score of 4.577, while the female participants got a mean score of 11.87 and a standard deviation of 3.399. The results show that the male participants got a higher mean score which means that the males achieved more than their female counterparts.

$H0_1$: There is no significant difference in achievement between students taught Biology with Blended learning approach and students taught with traditional method.

Source	Type III Sum of Square	Df	Mean Square	F	Sig.
Corrected Model	79.211[a]	2	39.606	2.488	0.106
Intercept	483.107	1	483.107	30.347	0.000
Pretest (Covariate)	0.005	1	0.005	0.000	0.986
Group	79.156	1	79.156	4.972	0.036
Error	350.229	22	15.919		
Total	4865.000	25			
Corrected Total	429.440	24			

Table 3: Analysis of Covariance (ANCOVA) Showing Students' Posttest Achievement Scores

Source	Type III Sum of Square	Df	Mean Square	F	Sig.
Corrected Model	167.241[a]	2	83.621	4.922	0.011
Intercept	699.532	1	699.532	41.172	0.000
Pretest (Covariate)	53.200	1	53.200	3.131	0.082
Group	12.055	1	12.055	0.710	0.403
Error	934.483	55	16.991		
Total	14032.000	58			
Corrected Total	1101.724	57			

Table 3 shows the ANCOVA analysis of the achievement of students taught Biology using blended learning approach and conventional method. The result indicates that $F_{(1, 55)} = 0.710$, $p = .403$ which is not significant at 0.05 alpha level. This means that there is no significant difference in the achievement of students taught Biology using blended learning approach and the conventional method. Therefore, the null hypothesis of no significant difference is accepted.

$H0_2$: There is no significant difference in male and female students' achievement in Biology after treatment using Blended learning approach.

Table 4: Analysis of Covariance (ANCOVA) Showing Male and Female Students' Posttest Achievement Scores

Table 4 shows the ANCOVA analysis of the achievement of male and female students taught Biology using blended learning approach. The result indicates that $F_{(1, 22)} = 4.972$, $p = 0.036$ which is significant at 0.05 alpha level. This means that there is a significant difference in the achievement of male and female students taught Biology using blended learning approach. Therefore, the null hypothesis of no significant difference is rejected.

Discussions

In Table 1, the results indicated that the control group got a higher mean score at after treatment this finding is in alignment with that of Khaled (2013) who concluded that there is no difference between students taught using blended learning instructional approach and those taught with conventional method in Saudi Arabia. Also, the findings do not align with the findings of Ezeanyika and Okigbo (2021) in Anambra state who concluded that there is difference in the mean achievement scores of students taught using blended learning instructional approach and those taught using conventional method in favour of the blended learning instructional approach. The difference in finding could be attributed to other extraneous factors not controlled for in this study. The result as presented in Table 2 shows that male participants got a higher mean score which means that the males achieved more than their female counterparts. This finding agrees with the finding of Okoro (2011) in Enugu State who concluded that gender differences exist in the achievement and interest of students in favor of male students. In Table 3, it was found that there is no significant difference in the pretest-posttest achievement of students taught Biology using blended learning approach and the conventional method. This finding is in consonance with the findings of Khaled (2013) who found no statistically significant difference between the pre-measurement and post-measurement in the experimental group in Saudi Arabia. This finding also does not aligns with the findings of Ezeanyika and Okigbo (2021) in Anambra State who concluded that there is a significant difference in the mean achievement scores of students taught using the blended learning instructional approach and those taught using the conventional method in favour of blended learning instructional approach. The difference in finding could be attributed to location, school type and sample sizes between this study and the previous studies. In Table 4, this study found a significant difference in the posttest achievement of male and female students taught Biology using blended learning approach in favour of the males. This finding supports the study of Okoro (2011) who found that gender differences exist in the achievement and interest of students in favour of the males.

Recommendations

The following recommendations are made based on the findings of this study. First, Workshops and seminars should be organized by state ministry of education for secondary school teachers on how to use Blended learning approach in teaching biological concepts. Secondly, Provisions should be made by local school authority and state government for computer, internet and power generating facilities that would enable teachers to adopt and students to learn to use the blended learning approach.

Conclusion

This study has shown that teaching approaches and strategies used by teachers in science (Biology) teaching has a significant effect on male and female students' achievement at the secondary school level. The study also revealed that the male students performed significantly better in Biology when taught transportation system and mechanisms using blended learning approach.

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