BLENDED LEARNING INSTRUCTIONAL STRATEGY AND STUDENTS' PERFORMANCE IN BIOLOGY

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Abstract
The study investigated Blended learning instructional strategy and students' performance in Biology in Ehime Mbano Local Government Area, Imo State. Three objectives, three research questions and three hypotheses guided the study. The study employed quasi-experimental research design. The population for the study consisted of 4,537 SS2 Biology students in Ehime Mbano Local Government Area, Imo State. One hundred and forty (140) SS2 Biology students in two intact classes formed the sample size for the study. One instrument was developed by the researcher which is Biology Performance Test (BPT) with 30 multiple choice questions drawn from two units (Mitosis and Meiosis). Reliability index for BPT of 0.84 was obtained using Kudder Richardson formula 21. Data obtained were analyzed using mean and standard deviation to answer research questions while hypotheses were tested using Analysis of covariance (ANCOVA) and t-test. The study revealed among others that students taught with Blended learning instruction achieved higher mean scores than the students taught with conventional method. Also, there was significant difference between the mean performance scores of students taught Biology using Blended learning instruction and those taught using conventional method. It was recommended that secondary schools should be adequately equipped with ICT facilities and workshop organized for teachers to enable them use blended learning in their teaching.

Keywords: Blended learning, Biology, Students' Performance, Instructiorial Strategy.

Introduction

The main purpose of communication in teaching and learning process is to change the behavior of the learner. The moment learner's behavior changes permanently, learning has taken place. Increase in computer activity in our society today, is evidence that the world is at the apex of 21st century innovation. When technology is infused within the curriculum, young learners are provided with a set of learning tools to assist them in achieving developmental academic goals across the curriculum (Judge, 2013). Today there are numerous computer programs available to support classroom instruction in order to facilitate learning and to increase students' interest in education. Such computer programs are called Blended Learning Instruction which involves the use of computers and other digital tools to supplement or assist classroom instruction. This combination is what is referred in this 21st century as blended learning Blended learning includes the use of computer in the classroom but not limited to it. This computer supported learning has considered as promoting skills development in students. As computer technologies advanced, the types of

assistance that Blended Learning Instruction systems could provide grew.

Blended learning are learning strategies that combine face-to-face classroom methods with considerable amount of other media related activities to enhance students learning, such media related methods include lectures posted on the school website by a teacher to his students, or videotaped lecture materials on disk or flash drives where students can watch at their own pace and time on computer or other digital device. Blended learning is a 21st century information and communication technology integration education program in which students learn at least in part through delivery of content and instruction through digital and online media with some element of student control over time, place, path, or pace. While still attending a brick-and-mortar school structure, face-to-face classroom methods are combined with computer-mediated activities. It brings about positive outcome and enhances retention if properly integrated. It encourages cooperation and collaboration among peers in the same class. It provides courage over one another and offers learners flexible teaching and learning environment. In blended learning, technology is used to serve multiple learning styles or needs, engage learners, prepare students for life after school, and bring the brick-and-mortar classroom into the 21st century. Classroom teachers have sought similar goals for years and have been incorporating resources to achieve the same outcomes. With the advent of technology and the ease of access that it affords, the unique environment for blended learning can be more easily and successfully created. This type of education is a process where technology and instruction inform each other as a complementary approach.

The effectiveness of Blended Learning Instruction has been demonstrated in research literatures. To date, it has been shown to be more effective especially as it affects students' academic on average, than other forms of intervention in education. In considering the results of evaluative research in computer assisted learning, one has to encourage teachers to adopt the method. Generally, computer-assisted learning software is under pinned by a constructivist theory of learning, one that has been active in the classroom as a more social constructivist view of learning. Presently, a variety of information and communication technologies (ICT) can facilitate not only the delivery of instruction, but also the quality of learning attained. Low achievements in science generally, and in Biology particularly among secondary school students is not encouraging. This is when viewed from the perspective of the importance in scientific development of any nation, especially a country considered to be under-developed like Nigeria. Unfortunately, the present State of education in developing nations especially Nigeria does not allow anyone to have much confidence in the system. In the secondary school level of Nigeria's educational system, problem such as poor performance of students owing to the instructional strategies adopted by teachers has serious implication and undesirable effects on the national economy. No educational system can rise above the quality of its teachers. Adeyemo (2012) emphasized that the quality of the teacher is an important input in effective learning since quality output demands quality input. Teachers' effectiveness can influence the students' academic. Teachers' quality is widely thought of as an essential determinant of academic, yet there is little agreement as to what specific characteristics make a good teacher.

Education is conceived as a process of transmission of factual knowledge only. The belief in the efficacy of education as a powerful instrument of development has led many nations to commit much of their wealth to the establishment of educational institutions at various levels. The quality and quantity of human and physical resources determine a nation's growth and development. The core of education is teaching and learning, and the teaching-learning process works best when there are effective teachers working with students (Stronge, 2014). An effective teacher is a teacher who consistently and rightly conducts a teaching- learning interaction to the satisfactory performance of desired intent as well as the values of the process, to the satisfaction of the interest groups based on professionally justifiable standards, ethnics and ideals with a measure of commendable creativity. Students' interest and academic performance in biology depend on many factors and stands out to show how well the subject is being taught. Hence, Festus (2014) contended that students' cognitive and manipulative performance become more positive after being exposed to method of instruction like blended learning instruction. The adoption and the use of these methods in teaching and learning of science based subject is essential, mostly when the expected results have not been achieved in students' external examinations, as well as internal examination. This is characterized with most teachers laying emphasis on the cognitive aspect of teaching and learning thereby neglecting the psychomotor and affective educational objectives. The later could be due to the teacher's lack or poor knowledge of the appropriate teaching methods for enhancing teaching and learning outcomes in the domains. This brings to limelight the need for more effective teaching strategies, possibly the blended learning instruction method of teaching which is expected to promote internalization of abstract concepts and enable the realization of goals of teaching science.

Gag, (2014) defined blended learning as a term used to explain the manner in which e-learning is being combined with traditional classroom methods to create a new hybrid teaching method. Blended learning is an educational program that combines online digital media with traditional classroom methods. Face-to-face classroom activities are integrated with computer medicated activities over content and delivery. Literatures show that no single definition of blended laming exists, or even a globally accepted agreement on the name itself.

Blended learning gives more flexibility to students giving them the opportunity to study at their own time and pace, while still attending classes using face-to-face methods. Difficulties encountered during their independent study could be brought to the classroom to be addressed by the teacher. Blended learning also offers students opportunities to develop their abilities and to handle technological tools to enhance their learning.

Blended learning has been discussed and researched for more than ten years but educators still perceive and define this approach in variety of ways. Mickelle, (2016) contended that blended learning has always been the norm for learners because natural learning takes place through a variety of different encounters. However, for instructional design, blended learning is not about the learning but rather about the teaching. Blended learning have been defined to include both face-to-face and online teaching where 30- 90% of the content is delivered online. Blended learning goes beyond classroom technology integration because students are expected to learn through online content delivery while

having some element of control over their own learning time, place, path, and pace The goal of blended courses is to combine the best features of in-class learning with the best features of online to deliver a valuable educational experience to students. However, the combination of learning modalities goes beyond repetition because true blended learning requires a meaningful integration of the face-to-face and online learning experiences. Blended learning is an interactive, student-centered approach that integrates engaging online content with the best features of classroom interaction, this approach also personalizes student learning and includes several forms of assessment for students and instructor. Most of the published research about blended learning does not align 'with this definition because the studies have not emphasized the use of pedagogical practices for both the online and in-class learning.

Benefits of Blended learning

1. It boosts learners efficiency: With blended learning, teachers can provide learners with instant access to their learning materials wherever they are and whenever they need them.
2. Builds engagement: One of the biggest challenges for teachers is engaging the students and keeping them interested in the learning materials because their attention spans are short and they have higher targets to achieve. In such scenario, effective blended learning is the best way forward.
3. Better communication: With blended learning you can easily update your learners on new announcement, assignment, test results and anything else regarding your course. Not only is this beneficial to students, but it is also vital for business.
4. Improved collaboration: Collaboration is one of the key factors necessary for effective learning. Blended learning enables the course participant to work together, engage in discussions and provided useful feedback to one another which undoubtedly leads to improvement and higher engagement.
5. Keeping track of learners progress: blended learning enables you to keep track of learners progress at any given time so that you can better understand their strength and weaknesses with fail.
6. Enhancing teaching efforts: because every learners needs are different and every learner follow a unique learning style. It is important to try to meet everyone's need so your course to be effective. You may encounter learners who will benefit more from reading text accompanied with presentations, and others who will understand the topics better after watching relevant videos.
7. Summing up: to improve information retention, engagement, and teaching, blended learning is more important than ever, irrespective of the industry. A good blend of learning formats goes a long way in offering efficient training to your workforce, curtailing costs, and extending the training accessibility.

Researchers have shown that most science teachers adopt conventional teaching methods which are teacher centered and subsequently result to poor learning outcomes (Ajoku, 2003). This has raised doubts among educators about the efficacy of teaching methods and approaches adopted over the years. Students' performance in biology depend on many factors and stands out to show how well the subject is being taught. Hence, Ekpete (2014) contended that students' cognitive and manipulative performance become more positive after being exposed to method of instruction like Blended Learning Instruction (Blended Learning

Instruction). The adoption and the use of these methods in teaching and learning of science based subject is essential, mostly when the expected results have not been achieved in students' external examinations, as well as internal examination. The later could be due to the teachers' lack or poor knowledge of the appropriate teaching methods for enhancing teaching and learning outcomes. This brings to limelight the need for more effective teaching strategies, possibly the Blended Learning Instruction method of teaching which can promote internalization of abstract concepts and enable the realization of goals of teaching science. Therefore, the focus of this study is to determine the blended learning instructional strategy and student performance in biology.

Aim and Objectives of the Study

The aim of the study is to determine the effect of blended learning instructional strategy on students' performance in biology. Specifically, objectives of the study are to:

1. find out the difference between the mean performance scores of students taught biology using blended learning instruction and conventional method.
2. Investigate the difference between the mean performance scores of male and female students taught Biology using blended learning instruction and conventional method.
3. Determine the difference between the mean performance scores of male and female students taught biology using blended learning instructional strategy.

Research Questions

The following research questions guided the study

1. What is the difference between the mean performances scores of students taught biology using blended learning instruction and conventional method?
2. What is the difference between the mean performance scores of male and female students taught biology using blended learning instruction and conventional method?
3. What is the difference between the mean performance scores of male and female students taught Biology using blended learning instruction strategy?

Hypotheses

Ho_1 There is no significant difference between the mean performance scores of students taught Biology using blended learning instruction and conventional method.

Ho_2 There is no significant difference between the mean performance scores of male and female students taught Biology using blended learning instruction and conventional method.

Ho_3. There is no significant difference between the mean performance scores of male and female students taught Biology using blended learning instruction strategy.

Methodology

The design of the study is quasi-experimental, using non-randomized pre-test, post control group design thus; intact class was used since it is not wise to disrupt existing class in a school. The population of the study consist of 4,537 (four thousand, five hundred & thirty-seven) SS2 biology students in eleven government owned secondary school in

Ehime Mbano L.G.A, Imo state. A sample size of (140) SS2 biology students in 2 intact class was randomly selected to form both the experimental & control group respectively. The experimental group consist of seventy (70) students with (34) male and (36) female. While the control group has seventy (70) with (32) male and (38) female. The tool for statistics gathering was a researcher designed 30 items objective test titled 'Biology Performance Test (BPT) drawn from topics taught to the students. The face and content validity was ascertained by two experts from dept of curriculum studies and educational technology and two experts from measurement and evaluation University of Port Harcourt. Their inputs was effected on the instrument. It was then administered to another 30 students in the same equivalent class who are not part of the sample.

The data produced was subjected to analysis using Kuder Richardson formula 21 which gave a reliability co-efficient for (BPT) of 0.84 which was acceptable for the study. The two groups were administered with pre-test before the treatment proper. The experimental group was trained with 'video clips' lesson by researchers trained assistant (class teacher) the control group was taught using conventional method for 2 weeks which is made of 3 times a week consisting of 1hour per contact smearing the tool videos intended to advance students performance. Each experimental group was taken to the ICT centre of the school where they have access to PCs with web connectivity. Using the lesson plan drawn, they were allowed to collaborate, share ideas and use different approaches to solve given problem. The students ask and answer questions as direct by the researcher assistant while the researcher monitored the progress of the lesson to ensure strict compliance with the lesson plan. The control group was trained with the same topic by their regular biology teacher using lesson plan based on conventional approach which revolve around the teacher only. The entire exercise lasted for 3 weeks after which a post-test was administered to both groups using a reshuffled or rearranged copy of the pre-test instrument and recorded over 100%. The fact generated was scrutinized using mean and standard deviation to answer research questions while the hypothesis was tested and analysed at 0.05 using ANCOVA and t-test.

Results

Research Question 1

What is the difference between the mean performance scores of students taught biology using blended learning instruction and conventional method?

Table 1: Mean, standard deviation and mean gain of students taught Biology using blended learning and those taught using the conventional method

		Pre- test		Post – test		Mean Gain
Method	**N**	**Mean**	**SD**	**Mean**	**SD**	
Blended learning	70	9.30	3.78	**27.19**	1.61	17.89
conventional	70	9.31	3.59	**23.46**	3.60	14.15

Table 1 shows the analysis of students' performance taught Biology using Blended learning and conventional method. Students taught with blended learning at post-test had the mean score of 27.19 and mean gain of 17.89 while students exposed to conventional method had the mean score of 23.46 and mean gain of 14.15.

Research Question 2

What is the difference between the mean performance scores of male and female students taught biology using blended learning instruction and conventional method?

Table 2: Mean, standard deviation and mean gain of male and female students taught Biology using blended learning and those taught using the conventional method

Methods			Pre-test	Post-test	Mean Gain
Blended	Male	Mean	9.41	27.18	17.77
Learning		N	34	34	
		Std. Deviation	4.00	1.57	
	Female	Mean	9.19	27.19	18.00
		n	36	36	
		Std. Deviation	3.62	1.67	
Conventional	Male	Mean	9.50	24.53	15.03
		N	32	32	
		Std. Deviation	3.74	3.39	
	Female	Mean	9.16	22.55	13.39
		N	38	38	
		Std. Deviation	3.49	3.56	

Table 2 shows the analysis of male and female students' performance taught Biology using Blended learning and conventional method. Male students taught with blended learning at post-test had the mean score of 27.18 and mean gain of 17.77, while female students exposed to blended learning had the mean score of 27.19 and mean gain of 18.00. Male students taught with conventional method at post-test had the mean score of 24.53 and mean gain of 15.03, while female students exposed to conventional method had the mean score of 22.55 and mean gain of 13.39.

Research Question 3

What is the difference between the mean performance scores of male and female students taught Biology using blended learning instruction?

Table 3: Mean, standard deviation and mean gain of male and female students taught Biology using blended learning

	Pre- test	Post – test	Mean Gain

Blended learning	**n**	**Mean**	**SD**	**Mean**	**SD**	
Male	34	9.41	4.00	27.18	1.58	17.77
Female	36	9.19	3.61	27.19	1.62	18.00

Table 3 shows the analysis of male and female students' performance taught Biology using Blended learning. Male students taught with blended learning at post-test had the mean score of 27.18 and mean gain of 17.77, while female students exposed to blended learning had the mean score of 27.19 and mean gain of 18.00.

Hypotheses

Hypothesis 1:

There is no significant difference between the mean performance scores of students taught Biology using blended learning instruction and conventional method.

Table 4: Summary of ANCOVA of students' performance in Biology using blended learning and those taught Biology using conventional method

Dependent Variable: Post-test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	
Corrected Model	488.137[a]	2	244.069	31.238	0.00	P < 0.05
Intercept	11760.031	1	11760.031	1505.163	0.00	P < 0.05
Pre-test	1.559	1	1.559	0.199	0.66	P < 0.05
Methods	**486.684**	**1**	**486.684**	**62.291**	**0.00**	**P < 0.05**
Error	1070.398	137	7.813			
Total	91323.000	140				
Corrected Total	1558.536	139				

Hypothesis 2:

There is no significant difference between the mean performance scores of male and female students taught Biology using blended learning instruction and conventional method.

Table 5: Summary of ANCOVA of male and female students' performance in Biology using blended learning and those taught Biology using conventional method

Dependent Variable: Post-test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	
Corrected Model	555.551[a]	4	138.888	18.694	0.00	P < 0.05
Intercept	11812.225	1	11812.225	1589.905	0.00	P < 0.05
Pre-test	.959	1	.959	0.129	0.72	P < 0.05
Methods * Gender	**554.098**	**3**	**184.699**	**24.860**	**0.00**	**P < 0.05**
Error	1002.985	135	7.430			
Total	91323.000	140				

Corrected Total	1558.536	139

Table 5 showed ANCOVA analysis showing the difference in blended learning and conventional method on male and female students' performance in Biology. The analysis showed that F(1,135) = 24.86)) is significant at 0.000 for method main effect therefore ($p < 0.05$)

Hypothesis 3:
There is no significant difference between the mean performance scores of male and female students taught Biology using blended learning instruction strategy.

Table 6: Summary of ANCOVA of male and female students' performance in Biology using blended learning method

Dependent Variable: post-test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	
Corrected Model	3.884[a]	2	1.942	0.745	0.48	P > 0.05
Intercept	7553.623	1	7553.623	2896.890	0.00	P < 0.05
pre-test	3.878	1	3.878	1.487	0.23	P > 0.05
Gender	**0.000**	**1**	**0.000**	**0.000**	**0.99**	**P > 0.05**
Error	174.702	67	2.607			
Total	51913.000	70				
Corrected Total	178.586	69				

Table 6 showed ANCOVA analysis sh showed that($p > 0.05$) and F (1, 67) = 0.99).) is significant at 0.000 for method main effect.owing the difference in the performance of male and female students in Biology exposed to blended learning. The analysis

Discussion

Mean performance scores of students taught biology using blended learning instruction and conventional method.

The result in table 1 shows that there is a difference between the performance mean scores of students taught Biology using blended learning and those taught using conventional method. Table 5 confirmed that the difference between the mean performance score was significant Thus, the significant value ($p < 0.05$ and F(1,137) = 62.29). The findings of the study therefore reveal that students taught biology concepts using blended learning performed better than those taught using conventional method.

This result is expected because effective use of these instructional strategy such as blended learning will help to improve the way learners learn, it will also bring about new method of learning in teaching and learning of Biology and it will also help them to be motivated, creative, and collaborative thereby facilitating and improving their performance in teaching and learning process. The findings agrees with the study of Ogechi, O.R. (2012), who opined that students multi-media mood enhanced

students' academic performance significantly better than the conventional method. The findings of Awan, M.U (2012), study revealed that Audio Recording and Communication was effective, since students who were exposed to the treatment performed better in the evaluation conducted than those who were not exposed to the treatment. Kearsley G. & Schneiderma B. (1999), asserted blended learning contributed more to students' critical thinking ability when compared with the method employing only traditional methods.

Mean performance scores of male and female students taught Biology using blended learning instruction and conventional method

The result presented on Table 2 showed that male and female students exposed to blended learning achieved higher than the male and female students exposed to conventional method considering their higher achievement mean scores at the post-test. Table 6 revealed that the interaction effect between the gender and methods was significant. This result is consistent with Rosen & Jorden (2016) who reported that students taught using blended learning instruction recorded high academic than those taught using conventional method. Gag, (2014) also reported the advantages of teaching science students using blended learning instruction helps students to develop a cognitive structure between what was learnt and what will be learnt.

Mean performance scores of male and female students taught biology using blended learning instruction

The result presented on Table 3 showed that females achieved higher than the males considering their higher performance scores at the mean gain. Table 6 equally revealed that difference in the performance mean scores of male and female students was not significant. This agrees with investigation by Zhang, Dang, Ravindran, and Osmonbekov (2016) on how gender, instructors and institutional support impacts on students' perceived accomplishment, perceived enjoyment and satisfaction. It was discovered that female students accomplished and perceived enjoyment which significantly imparted their learning outcome and performance while for male students' no significant impact was found which also affect ted accomplishment.

Conclusion

Based on the outcome of this study, conclusion was drawn.

Students taught with blended learning instruction performed higher than the students taught with conventional method. There is significant difference between the mean performance scores of students taught biology using Blended Learning Instruction and conventional method.

Recommendations

Based on the findings of the study, the following recommendations are made.

1. Biology teachers should be encouraged to use Blended Learning Instruction because it will help to improve students' performance during teaching and learning process
2. Both male and female biology students should be encouraged to study biology together in order to discourage gender issues in science subjects
3. Secondary schools should be adequately equipped with computer facilities to enable them employ Blended learning in their teaching.

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