WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Effect of Blended Learning Instructional Strategy on Secondary School Student's Academic Achievement in Physics

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ABSTRACT

The purpose of this study was to examine the effect of blended learning instructional strategy on secondary school student's academic achievement in Physics. Quasi-experimental research design was adopted for the study which was carried out in Aguata Education Zone of Anambra State. Two research questions and two research hypotheses guided this study. The target population of the study was all the 1711 SSII Physics students from forty (40) co-educational public secondary schools in the zone and two schools were purposively selected. The sample size for the study was ninety one (91) students, comprising of fifty four (54) male and thirty seven (37) SSII physics student from two (2) intact classes in the two coeducational public secondary schools used for the study. The instrument used for data collection was the Physics Achievement Test (PAT) and were subjected to face and content validity by sending the initial draft of the instrument to three (3) experts in Physics Education,Measurement and Evaluation .The reliability coefficients of0.72 was obtained for PAT usingKuder-Richardson (K-20).Treatment lasted for four weeks; PAT was used for Pretest and Posttest. From the data collected the research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test the hypotheses formulated at 0.05 level of significance. The result of the analysis indicated that Blended learning instructional strategy is more effective in enhancing students' achievement in Physics compared with conventional teaching method. Also achievement of male students taught Physics with blended learning instructional strategy is slightly higher female students taught Physics with blended learning instructional strategy. Based on the above findings the following recommendations were made among, teachers should engage them self on trainings on the use of computer and internet facilities in teaching and learning.

Key words: Blended learning instructional strategy, Physics, and Academic Achievement.

Introduction

Physics is a science subjects that deals with the study of energy, matter and their interactions. It is the soul of science and technology creations because its principles, laws and theories are the roots of technological advancements. As a subject of study Physics has been viewed from deferent perspectives by science educators. According to Ike (2002) Physics is the study of laws that determines the structures of the universe with reference to matter and energy. Also Erinosho (2013) viewed Physics as a branch of science that deals primarily with the inanimate world and which concerned with trying to identify the most fundamental and unifying principles of life. From the above definitions Physics generally anchors on matter and energy. Matter which virtually relate to anything that has weight and occupies space. Therefore one can rightly says that almost everything and activities in the universe has a relationship directly or indirectly with Physics.

As a subject Physics is taught in Senior Secondary School in Nigeria education system. It is one of the major prerequisite for one who wants to venture into science and technology related disciplines. The objectives of teaching Physics in Secondary School are to: provide basic literacy in Physics for fundamental living in society; acquire basic concept of Physics as preparation for further studies; acquire essential scientific skills and attitudes as a preparation for technological application of Physics and stimulate and enhance creativity(FRN, 2009). In a similar view Atadoga (2000) further observed that the objectives of teaching Physics in the secondary school includes; learning of the fundamental facts and principles of science; development of the abilities and skills needed to engage in the processes of sciences and inculcation of positive attitude about and appreciation for science and consequences of science. These objectives if achieved or attained above average will have a tremendous advantage to mankind and the society at large.

Unfortunately the actualization of the above objectives of teaching Physics in Senior Secondary Schools has been a mirage as there has been a decline in the students achievement in Physics as observed by science education researchers (Biodum,2004; Olorukooba2007;Aina 2013). Also evidently shown in statistics of Students' Academic Performance in WAEC Physics (2004-2013) are as shown as follows: In the year 2004, the percentage credit is 47.51%,percentage passed 32.18% and 20.30% failed, year 2005, the percentage credit is 47.56%,percentage passed 30.65% and 19.27% failed, year 2006, the percentage credit is 51.02%,percentage passed 29.25% and 19.72% failed,year 2007, the percentage credit is 43.19%, percentage passed 33.49% and 21.14% failed,year 2008, the percentage credit is 48.26%, percentage passed 21.95% and 28.18% failed,year 2009 the

percentage credit is 47.83%, percentage passed 30.41% and 17.16% failed,year 2010 the percentage credit is 39.01%, percentage passed 34.06% and 26.93% failed,year 2011 the percentage credit is 47.57%, percentage passed 15.41% and 37.02% failed,year 2012 the percentage credit is 45.24%, percentage passed 34.53% and 20.24% failed,and year 2013 the percentage credit is 48.48%, percentage passed 26.77% and 24.75% failed. The plot below clearly shows performance of students in WAEC for the past 10 years.

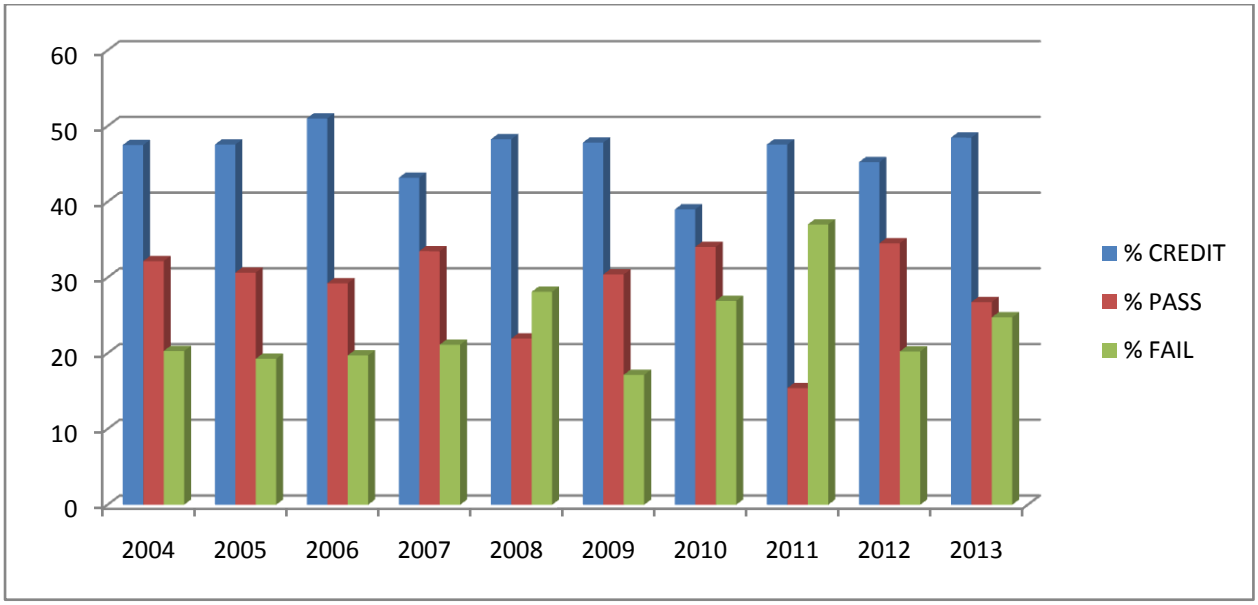

Fig.1. Plot of Students' Academic Performance in WAEC Physics (2004-2013).

Source: WAEC Research and Statistics Unit, Port Harcourt

Critical looking at the plot above, analyzed from data obtained from the examination body showed that it was only in 2006 that a little more than 50 percent of students scored credit and above. In 2010 more than 50 percent could not get a credit in Physics. The development of any nation depends on science and technology therefore this colossal achievement failure in Physics calls for urgent attention towards finding a lasting remedy before it metamorphosis into a national tragedy. This observed poor performance is believed to be due to inappropriate methods of teaching and over use of conventional teaching method(Olorukoba, 2007; Adebayo, 2011 &Omole, 2011). Furthermore Rawatee (2014) observed that there is a serious disconnection between the ways of learning and methods of teaching in Physics and most teachers use the same ineffective Conventional Method they were taught with, for today's Physics teaching thereby resulting in half baked knowledge impartation to students in Physics. Conventional Teaching Method is a method of instruction in which the teacher dishes out information to students who are at the receiving end. Conventional Teaching Method is teacher centered. It has a lot of advantages like it can accommodate large number of student but Conventional Teaching Method does not stimulate students' innovation, inquiry and scientific method (Adewuya 2002 & Abdu-Raheen 2012). Therefore in this information technology revolution age, it calls for innovative teaching method that will promote excellent, motivate students in learning and results into a transformative educational experience, provide a verifiable scaffold, relevant and important for science and technology improvement. The ICT compliant instructional strategy considered by the researcher is Blended Learning Instructional strategy.

Blended Learning Instructional strategy can be defined instructional strategy that combined online digital media with conventional teaching method in class room delivery. The term blended learning instructional strategy is used interchangeably in research literature as "personalized learning", "differentiated instruction","hybrid learning","technology-mediated instruction"," web-enhanced instruction" and "mixed-mode instruction". The concepts behind blended learning was first developed in the 1960s, the formal terminology to describe it did not take its current form until the late 1990s. Then in 2006, the term became more concrete with the publication of the first Handbook of Blended Learning by Bonk and Graham. The term Blended Learning Instructional strategy has been defined by several researchers. Williams, Bland and Christle (2008) define blended learning as a combination of conventional face to face learning and distributed learning. Graham (2006) also defined blended learning approach as a combination of face to face with computer mediated instruction. One singular identity of blended learning is its ability to apply a refined techniques from both, ICT assisted and conventional teaching method. According to Osguthrape and Graham (2003) the main feature of blended learning is making the whole operation depends on student's interaction with computer and help them to be more creative and positive, and teachers' role is to control the work flow of the computerized subjects.It has a lot of advantages. As summarized by Graham, (2006) it has the potential advantages in offering a more effective education, convenience and access to teaching-learning environment. Also Davies and Graff (2005) suggested that such learning environment promotes student centered learning and encourages greater interaction between students. From the above literature it could be summarized that blended learning instructional strategy will provide a big convenience for a subject to actualize its educational aim and objectives by combining face to face interaction in conventional learning and time; place and material richness provided by web-based learning. It is against this that the researcher tends to investigate empirically the effectiveness of blended learning instructional strategy on secondary school student's academic achievement in physics.

Statement of Problem

Studies showed that failure in Physics at senior secondary certificate examination is high. This ugly trend could be attributed to a number of factors of which inappropriate methods of teaching and over use of conventional teaching method are major factors. In teaching and learningteaching method play a vital role toward concretizing learning. Teaching method used by a teacher makes learning interesting and meaningful, also helps to improve student's academic achievement. But over use of conventional method and inappropriate teaching method has brought about little or no improvement in the education system. Therefore the need to explore other innovative method, employ modern and technology based instructional approach becomes a matter of urgency. It is on this note that the researcher tends to examine the effect of blended learning instructional strategy on students' academic achievement in Physics.

Purpose of the Study

The purpose of the study was to investigate the effect of blended learning instructional strategy on students' academic achievement in Physics in Anambra State. Specifically the study sought to:

1. Find out if there is any difference between the achievement scores of students taught Physics using blended learning instructional strategy and those taught using conventional teaching method.
2. Find out if there is any difference between the achievement scores of male and female students taught Physics using blended learning instructional strategy.

Research Questions

The following research question guided this study;

1. What are mean achievement scores of students taught Physics using blended learning instructional strategy and those taught using conventional teaching method?
2. What are mean achievement of male and female students taught Physics with blended learning instructional strategy?

Research Hypotheses

The following research hypotheses were formulated and tested at significant level of 0.05

1. There is no significant difference in the mean achievement scores of students taught Physics using blended learning instructional strategy and those taught using conventional teaching method.
2. There is no significant difference in the mean achievement of male and female students taught Physics with blended learning instructional strategy.

Research Methodology

The study adopted quasi experimental research design, specifically pretest-posttest non-equivalent control group design. The area of study was Aguata Education zone of Anambra State. There are forty-eight (48) Public Senior Secondary Schools in the Zone of which forty (40) are co-educational. The population of the study consists of all the 1711 students SSII Physics students.SSII was used because the topics taught fell under the SSII Physics curriculum. Also co education school was used because the researcher wanted to find out if blended learning instructional strategywould have any influence on the achievement of students in Physics based on their gender. The sample size for the study was ninety one (91) students, comprising of fifty four (54) male and thirty seven (37) SSII physics student from two (2) intact classes in the two coeducational public secondary schools in Aguata zone. Purposive sampling technique was used to select two (2) senior secondary schools out of the secondary schools in Aguata Education Zone, schools that has qualified physics teacherswith at least (B.Sc.),with not less than five years experience and also computer literate. The instrument for data collection was Physics Achievement Test (PAT). Some items of PAT were constructed by the researcher and some were adopted from West African Examination Council (WAEC) and it consisted of forty five (45) multiple choices questions, based on the Secondary School Physics Syllabus. The instrument was subjected to face and content validity by sending the initial draft of the instrument to three (3) experts in Physics Education and Measurement and Evaluation. These experts read through the draft of the instrument and made recommendations which were used to modify and standardize the items to forty (40) multiple choices questions. The items were pilot tested using 20 SSII Physics students selected from a secondary school in Awka Education Zone.Kuder- Richardson's formula (K-21) was used to estimate the reliability index of PAT to be 0.77. The research assistance (Physics Teachers) was trained for a week in order to get acquainted with the contents in the lesson plan. The experimental group was taught using blended learning instructional strategy while control group was taught using conventional teaching method.Before the commencement of the treatment, PAT was administered to the SSII Physics students as pre-test. After that, the actual experiment which lasted for 4 weeks started. At the end of the experiment, PAT was also administered to the same class of students as post-test. At the end both pre test and post test were recorded for analysis. Means and Standard Deviation were used to answer the research questions while the hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA).

Results

Research Question One: What are mean achievement scores of students taught Physics using blended learning instructional strategy and those taught using conventional teaching method?

Table 1: Mean and Standard Deviation of the mean achievement scores of students taught Physics using Blended Learning Instructional Strategy and those taught using Conventional Teaching Method.

Strategy		PRETEST		POSTTEST		GAIN	
	N	Mean	SD	Mean	SD	Mean	SD
CMT	42	14.05	8.21	48.1	13.87	34.05	11.83
BLIS	49	14.64	8.65	72.45	16.55	57.81	17.08

Table 1 shows mean and standard deviation of the achievement scores of students taught Physics using Blended Learning Instructional Strategy and those taught using Conventional Teaching Method. From the result, the mean and standard deviation of pre-test and post-test scores of students taught with Blended Learning Instructional Strategy are 14.64, 8.65 and 72.45, 16.55 respectively. This gives a mean gain score 57.81. While the mean and standard deviation of the pre-test and post-test scores of the students taught with Conventional Teaching Method are 14.05, 8.21 and 48.10, 13.87 respectively. This gives a mean gain of 34.05. Thus students taught Physics using Blended Learning Instructional Strategy has a higher mean gain than those taught Physics using Conventional Teaching Method.

Research Question Two: What are mean achievement of male and female students taught Physics with blended learning instructional strategy

Table 2: Mean and Standard Deviation of the mean achievement scores of male and female students taught Physics using Blended Learning Instructional Strategy.

		PRETEST		POSTTEST		GAIN	
Gender	N	Mean	SD	Mean	SD	Mean	SD
Male	54	14.31	8.22	62.59	20.02	48.29	20.49
Female	37	14.46	8.78	59.19	18.97	44.73	16.64

Table 2 shows mean and standard deviation of the achievement scores of male and female students taught Physics using blended learning instructional strategy. From the result the mean and standard deviation of pre-test and post-test scores of the male students are 14.31, 8.22 and 62.59, 20.02 respectively, this gives a mean gain scores of 48.29. Also, the mean and standard deviation of pre-test and post test scores of the female students are 14.46, 8.78 and 59.19, 18.97 respectively, this gives a mean gain scores of 44.73. However, the mean gain difference between male and female students is 3.56 in favor of the male students. Therefore male students taught physics with blended learning instructional strategy achieved higher than their female counterparts taught physics with the same instructional strategy.

Research Hypotheses 1: There is no significant difference in the mean achievement scores of students taught Physics using blended learning instructional strategy and those taught using conventional teaching method

Table 3: Analysis of Covariance (ANCOVA) result for the mean achievement scores of students taught Physics using Blended Learning Instructional Strategy and those taught with Conventional Teaching Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	15707.584[a]	2	7853.792	36.891	.000
Intercept	61372.244	1	61372.244	288.279	.000
PreTest	2294.292	1	2294.292	10.777	.001
Strategy	13005.800	1	13005.800	61.091	.000
Error	18734.449	88	212.891		
Total	375375.000	91			
Corrected Total	34442.033	90			

a. **R Squared** = .456 (**Adjusted R Squared** = .444)

Table 3 reveals that the effect of instruction on secondary school students taught Physics using blended learning instructional strategy

and those taught using conventional teaching method produced F= 61.091 and this value is significant at 0.000. The value of F is significant at 0.05. That is (p= 0.000; p<0.05). The physics students taught using blended learning instructional strategy produced significant difference on their achievement, hence the null hypothesis which states that there is no significant difference between the mean achievement scores of students taught Physics using blended learning instructional strategy and those taught with conventional teaching method is rejected.

Research Hypotheses 2: There is no significant difference in the mean achievement of male and female students taught Physics with blended learning instructional strategy.

Table 4: Analysis of Covariance (ANCOVA) result of the mean achievement score of male and female student taught Physics using the blended learning instructional strategy.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2971.323[a]	2	1485.662	4.154	.019
Intercept	60348.937	1	60348.937	168.751	.000
PreTest	2717.003	1	2717.003	7.597	.007
Gender	269.539	1	269.539	.754	.388
Error	31470.710	88	357.622		
Total	375375.000	91			
Corrected Total	34442.033	90			

a**. R Squared** = .086 (**Adjusted R Squared** = .066)

Table 4 shows that the effect treatment on male and female students taught with blended learning instructional strategy produced F value of .388. The value of F is not significant at 0.05. That is (p= 0.388; p> 0.05). Physics student's student taught using blended learning instructional strategy produced no significant difference on the mean achievement score of male and female students. Therefore, the hypothesis which states that is hereby there is no significant difference between the mean achievement score of male and female student taught Physics using the blended learning instructional strategy isnot rejected.

Discussion of Findings

Students taught with Blended Learning Instructional Strategy achieved higher than those taught using Conventional Teaching Method. Also a significant different was found to exist in the academic achievement of Physics students taught with Blended Learning Instructional Strategy and Conventional Teaching Method. The finding is not supported by findings of Ibrahim and Mehmet (2014) on their research studies, they observed that the use of internet in learning makes the quality of learning slightly declined, but is supported by the findings of Yusuf and Afolabi, (2010), Etukudo (2009) and Abidoye (2015) who observed that internet and blended approaches were more useful in improving students' performance than conventional method.

Also there is a slightdifference in the mean achievement of male and female student taught Physics with Blended Learning Instructional Strategy in favor of the male students. But the difference is not significant. The finding is not consistent with finding of Awoniyi (2000) who observed that there was gender difference in the use of computer and internet facilities. In other way the finding is consistent with the studies of Umoren (2006), Chado,(2009) and Abidoye (2015) who were of the view that gender difference in academic achievement does not exist.

Implication of Result

The implication of the result of this study is that the teaching methodology utilized by a teacher in teaching and learning process affects student's academic performance.

Conclusion

The following conclusions were drawn based on the findings in this study.

1. Blended learning instructional strategy is more effective in enhancing students' achievement in Physics compared with conventional teaching method.
2. There is a significant difference in the mean achievement scores of students taught Physics using blended learning instructional strategy and those taught using conventional teaching method.
3. Achievement of male students taught Physics with blended learning instructional strategy is higher female students taught Physics with blended learning instructional strategy
4. There is no significant difference in the mean achievement of male and female students taught Physics with blended learning instructional strategy.

Recommendation

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

1. Teachers should engage them self on trainings on the use of computer and internet facilities in teaching and learning.
2. Blended learning instructional strategy should be adopted and implemented during instructional process in view of enhancing the student's academic achievement.
3. Professional educational bodies should organize workshops and seminars to train Physics teachers on the use blended learning instructional strategy in order to keep them abreast with modern innovative teaching strategies.
4. Finally, government should provide computer in our classrooms with full access to internet to our secondary schools to enable teachers and students have easy access to it.

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