

RELATIVE EFFECTIVENESS OF BLENDED LEARNING INSTRUCTIONAL APPROACH ON ACADEMIC ACHIEVEMENT OF PHYSICS STUDENTS IN SECONDARY SCHOOLS IN ONDO STATE, NIGERIA.

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Abstract

The study investigated the relative effectiveness of blended learning instructional approach on students' academic achievement in Physics in Ondo State secondary schools. The study adopted the quasi experimental pre-test post-test control group design. A total of 120 senior secondary school two students drawn out of four public secondary schools were purposely selected as the samples. Two schools were used for each of the experimental and control groups. The students in the experimental groups were taught using Blended Learning Instructional Approach while the students in the control group were taught using conventional method. Physics Students Achievements Test (PSAT) was developed, validated and used to generate data for the study. The hypotheses generated were tested using t-test. The result of the study showed that students taught with blended learning instructional approach performed significantly better than those taught using the conventional method. Gender has no effect on the students' academic achievement when exposed to the same amount of activities. Based on the findings of this study, it was recommended that trainings, seminars and workshops on the use of blended learning instructional approach and e-learning should be organized for physics teachers. Teacher training programs should incorporate the blended learning instructional approach in the curriculum for per-service teachers while schools should be adequately equipped with complete systems and internet facilities.

Keywords: Blended learning, e-learning, instructional approach, internet facilities.

Introduction

Physics is the branch of science concerned with the properties of matter and energy and the relationship between them. It is the study of matter and natural event which is based mostly on empirical observations and qualitative measurements. It also provides basic understanding and development of new instruments, skills and techniques for Agricultural, Earth, Biological, Chemical, Environmental, Physical and Medical Sciences (Ayoola, 2016). Hence, Physics establishes basic knowledge needed for scientific advancement, which is the economic engine of any nation.

However, the concept of Physics are better understood when the conventional method of teaching used by the teachers is accompanied with other hands-on methods that enhance students' active learning through self-discovery or inquiry. Good teaching is the result of exposing students to certain experience through adequate guidance and providing appropriate learning activities, so that the students acquire the best from the learning (Owolabi and Oginni, 2013).

It has been discovered that a single mode of instructional delivery system may not provide sufficient choices, engagement, social contact, reliance and context needed to facilitate successful learning and performance (Carner, 2010). The information and communication technology revolution is transforming the various means at which the 21st century education is being delivered all over the world. This transformation is characterized by the emergence and convergence of modern digital technologies to improve teaching and learning environments as well as cope with an ever increasing demand for education and training (Abidoye, 2015).

Carefully developed, structural and self-guided learning and teaching materials can be delivered through various but appropriate technologies (Swart, 2012). These can take different formats such as animated instructions, audio-visual instruction, and audio instruction among others, which can be combined differently by the teacher in order to implement a meaningful but successful instruction in form of e-learning, online- learning, blended learning, m-learning among others (Olelewe, 2014).

Blended learning, also called hybrid learning is defined as a combination of e-learning and the traditional face-to-face learning or instructor-led-training (ILT), with necessary coaching, assignments and projects provided as support and reinforcement tool (Chui & Mangit, 2006). Caulfield (2011) asserted that blended learning is a natural development to the growing accessibility of e-learning, online resources and the continue need for a human component in the learning experience while Wang (2010) was of the opinion that Blended learning incorporates online discussion into the classroom.

According to Azizan (2017), blended learning consumes the best of both worlds for secondary schools students; the fluidity of using internet resources and the reassurance of face-to-face experiences. Blended learning aims to improve the quality and develop the quality of educational activities in two vertical and horizontal diversions by the use of

different instruments and progressive technologies. In the horizontal dimension, it tries to expand the extent of instruments which facilitate learning in a learning strategy in such a way that with their best combination, the highest quality would be obtained. In the vertical dimension, it proceeds to the in-depth analysis of learning and the better understanding of educational materials, and what techniques to use for teaching the subjects to achieve an optimized learning (Valiathan, 2008; Karamizadeh, Zarifsanayei, Faghihi and Habibi, 2012).

Since either pure e-learning or traditional learning hold some weaknesses and strengths, it is better to mix the strength of both learning environments to develop a new method of delivery called blended learning (Tayebinik, 2009).

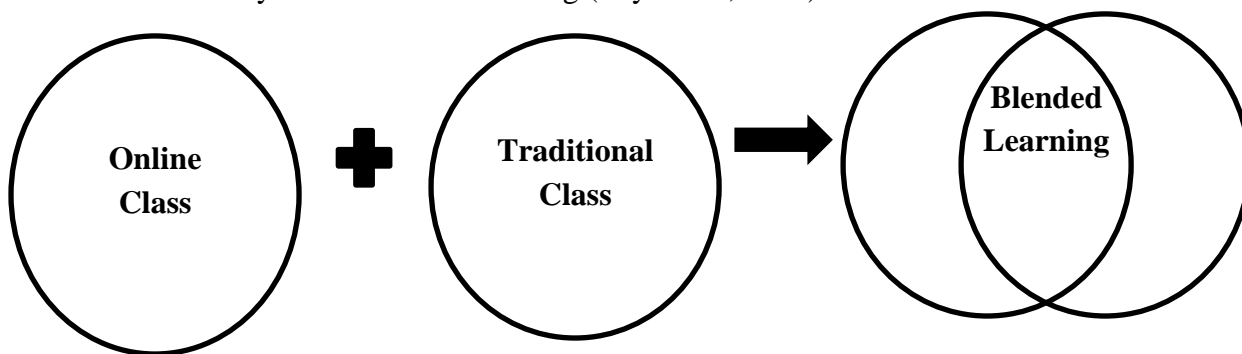


Figure 1: Blended Learning Environment

Source: Adapted from Tayebinik, 2009

Finding from U.S. Department of Education on online courses and Blended learning revealed that “students in fully online condition performed modestly better, on average, than those learning the same material through traditional face-to-face instruction. Combining online and face-to-face instructions had a larger advantage than purely online instruction (Means, Toyama, Murphy, Bakia and Jones, 2010). Ravia and Jordan (2004) concluded in their research that “blended courses produce a stronger sense of community among students than either traditionally or fully online courses”.

Gender disparity has been noticed and reported by various researchers concerning students’ enrolment and poor learning outcome in Physics. According to Ogunneye and Lasisi (2008), female enrolment in Physics and science subjects in general, is very poor. This is in line with the study of Gonzuk and Chargok, (2001) which revealed that the number of females who study Physics on secondary and tertiary institutions is small compared to the number of males. In contrast, Owolabi (2003) and Babajide (2010) found that gender has no significant influence on achievement in science. This controversy on influence of gender on achievement calls for more studies into the role of gender in students’ achievement in Physics.

The learners’ attitude towards Physics is associated with academic achievement. Edermir (2009) affirms that attitude whether positive or negative affect learning in science. In the study of Aiyelabegan (2003), he reveals that students’ attitude is one of the factors affecting students’ performance in Physics. Adodo and Gbore (2012) posit that teachers

should have positive attitude and use interesting teaching method(s) in teaching of science in order to improve students' performance and bring out lasting and permanent positive attitude towards science. The studies carried out in Nigeria on blended learning applications were mostly in higher institutions as compared to studies in America and Europe (Abidoeye, 2015). This study aims to investigate the effectiveness of blended learning instructional approach on academic achievement of secondary school students in Physics in Nigeria.

Statement of the Problem

The researcher's observations from teaching Physics and marking of Physics examinations questions in both internal and external examinations have shown that the grades of students in Physics have remained relatively low when compared with other subjects. The reports of the Chief Examiner in West African Senior School Certificate Examination (WASSCE) indicated that teacher's teaching approach, among other factors, has a significant influence on students' achievement in Physics. The need to digress from the traditional method of teaching and adopt modern innovative approaches is thereby essential. To this end, this study is out to examine the effectiveness of blended learning instructional approach on academic achievement of students in Physics in Ondo State secondary schools.

Research Hypotheses

The following research hypotheses were formulated for this study:

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

Research Design

This study employed quasi experimental of pre-test, post-test non-randomised control group design which examined the effect of blended learning instructional approach on students' achievement in Physics.

Sample and Sampling Techniques

The sample for this study consisted of 120 senior secondary school 2 (SSS2) students offering Physics who were randomly selected from four secondary schools in Ondo State for the 2017/2018 academic session. 30 senior secondary school 2 students offering Physics were randomly selected from each school.

Two schools were used as experimental groups while the remaining two schools were used as control groups. The selected schools were considered to have qualified Physics teachers and have presented students for senior secondary school certificate examinations. The two schools to be used as experimental groups were purposively selected.

Research Instruments

The instruments used for the study included Physics Students' Achievement Test (PSAT), Blended Learning Instructional Package (BLIP). The instrument PSAT consisted of two sections: A and B. Section A was drawn to elicit information on students' bio-data such as name of school, class and sex of the students. Section B contain 40 items multiple choice questions which focused on measuring students' performance in the selected topics. The instrument was administered on both the experimental and control groups.

The Blended Learning Instructional Package

The instrument BLIP consists of Physics contents linked with website and which can be accessed through internet via computer system. This instrument was used for the experimental group only.

Validity of the Instrument

Face and content validities of the instruments were ensured by experts in Physics Education, Department of Guidance and Counseling and Computer Education. The BLIP was validated by experts in Physics Education, Science Education. Their comments and suggestions were strictly adhered to and the corrected version used for data collection.

Experimental Procedure

Before the commencement of the study, the students and Physics teachers of the selected schools were properly trained on how to use computer and the internet facilities. The study was conducted for six weeks. Before treatment stage, both experimental and control groups were given pre-test, inform of Physics Students' Achievement Test.

At the treatment stage, students in the experimental group were taught projectile and equilibrium of forces using the Blended Learning Instructional Package (BLIP) in the laboratory with the use of computer and internet facilities. A computer was allocated for each student. The students were allowed to perform learning activities, ask questions and submit their assignments via the internet. This was carried out with the assistance of trained and experience Physics teachers. The students in the control group were taught the Physics contents using the conventional method. After treatment, both experimental and control groups were given post-test.

Data Analysis

The data collected were analyzed using t-test.

Results

Hypothesis 1

There is no significant difference in the achievement mean scores of students taught with blended learning instructional approach and student taught using conventional method.

Table 1: t-test analysis of the pre-test scores of students before the use of teaching methods

Group	N	Mean	SD	Df	tcal	t-tab	Remarks
Blended Learning Approach	60	13.2	3.64	118	0.30	1.98	Not Sig.
Conventional Method	60	13.0	3.75				

* P < 0.05

From table 1, the result showed that at $P < 0.05$, t-calculated was 0.30, df was 118, and t-table was 1.98. It could be seen that the $t\text{-cal} < t\text{-table}$ at 0.05 level of significance. This implies that there was no significant differences in the achievement mean scores of students in pre-test before they were exposed to teaching methods.

Table 2: t-test analysis of the achievement mean scores of students in post-test using teaching methods

Group	N	Mean	SD	df	tcal	t-tab	Remarks
Blended Learning Approach	60	27.8	7.70	118	8.61	1.98	Significant
Conventional Method	60	17.9	4.48				

* P > 0.05

From table 2, the result showed that the mean score and standard deviation of students taught with blended learning instructional approach were 27.8 and 7.70 while the mean score and standard deviation of students taught with the conventional method were 17.9 and 4.48, respectively at 0.05 level of significance, the calculated t-value (8.61) is greater than the table value (1.98). Since $t\text{-cal} > t\text{-tab}$, we reject the null hypothesis of no significance between the achievement mean scores of the students. Hence, there is significant difference in the achievement mean scores of students taught with blended learning instructional approach and conventional method.

Hypothesis 2:

There is no significant difference in the achievement mean scores of male and female students taught with blended learning instructional method.

Table 3: t-test analysis of the post-test scores of male and female students exposed to blended learning instructional package

Variable	N	Mean	SD	df	tcal	t-tab	Remarks
Male	61	28.29	7.54	58	0.16	2.00	Not Sig.
Female	59	27.95	8.49				

* P < 0.05

From table 3, the mean score and standard deviation of male students exposed to blended learning instructional method were 28.29 and 7.54, respectively while the mean score and standard deviation of female students exposed to the same treatment were also 27.95 and 8.49, respectively at 0.05 level of significance, the calculated t-value (0.16) is less than the table value (2.00) at degree of freedom (df) 58. Since $t_{cal} < t_{table}$, we refuse to reject the null hypothesis. Therefore, there is no significant difference in the achievement mean score of male and female students taught with blended learning instructional method.

Discussion

The findings of this study revealed that students' achievements in Physics in both experimental and control groups in pre-test were low and did not differ statistically. This implies that there was no significant difference in the pre-test mean scores of the students in the experimental group (using blended learning instructional approach) and control group (using conventional method). This established the homogeneity of the two groups involved in the study prior to the experiment. In other words, it could be said that the knowledge baseline for the groups involved in the study were equal.

The findings of this study also showed that there was significant difference in the achievement mean scores of the two groups after the treatment. This implies that there was improvement in the performance of students resulting from their exposure to the treatment. This corroborates the finding of Means et al (2010), who posited that the combination of online instruction with conventional method is of greater academic advantage. The implication of this is that the use of Blended Learning Instructional Approach is a teaching strategy for enhancing students' achievement in Physics.

Hypothesis two sought to find the difference in the achievement mean scores of male and female students taught with the blended learning instructional approach. The study revealed that the achievement of students on Physics is not determined by gender. That is, the effect of gender on students' achievement in Physics was not statistically significant. This corroborates the findings of Owolabi (2013) and Babajide (2010) who in their separate researches found out that gender difference of students has no significant influence on their academic achievement.

Conclusion

From the findings of this study, it was concluded that there is significant teaching effect on students' achievement mean scores in the two groups. The use of Blended Learning Instructional Approach was more effective for the teaching and learning of Physics than the conventional method (since students who were exposed to blended learning instructional approach performed better than those taught with the conventional approach in the achievement test). Also, gender does not influence the performance of students when they were subjected to equal amount of activities.

Recommendations

Based on the findings of this study, it was recommended that:

1. The mode of teaching Physics at senior secondary school level should be modified so as to accommodate functional student-centered and blended learning instructional approach that will make Physics students good problem-solvers.
2. Secondary school teachers who are already in service should be given adequate training through workshops, symposia, conferences and seminars to enhance and acquire better strategies of teaching Physics.
3. Since most teachers teach in the way they have been taught, teacher-training programmes should incorporate blended learning instructional approach, which will produce a new breed of teachers who will be able to implement blended learning instructional approach which is lacking in our schools.
4. Secondary school should be adequately equipped with computer systems and get connected with internet so as to have access to online learning
5. Male and female students should be encouraged to study science subjects (especially Physics) as both of them are capable of excelling in the subject(s).

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