

Effects of Blended Learning Strategy On Senior Secondary School Students' Performance in Mathematics in Ekiti State

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Abstract

The study examined the effect of blended learning strategy on senior secondary school students' performance in Mathematics in Ekiti State. The study specifically examined the effects of blended learning on students' performance in Mathematics; and the performance of students taught mathematics using blended learning and those taught using conventional method before and after treatment. The study adopted quasi – experimental of pre-test post-test control group design type (one experimental group and one control group). The population of the study consisted of all Senior Secondary School Two (SSS II) students in public secondary schools in Ekiti State. A total sample of 114 students was selected from the four public secondary schools through multi-stage sampling procedure. A self-designed instrument tagged Performance Test in Mathematics (MPT) which was divided into two sections namely section A and B was used by the researchers to collect data for this study. The instrument was validated by Tests and Measurement experts while the internal consistency of the instrument was established through Cronbach's Alpha statistics which yielded coefficient value of 0.831. The experimental procedure was divided into three stages: the pre-treatment, treatment and post-treatment stages. Performance of students in pre-test and post-test were collated and subjected to descriptive and inferential statistics. The findings of the study revealed that there was no significant difference in the performance of students taught using blended learning and conventional method before treatment but there was significant difference after treatment. It was recommended among others that Mathematics teachers should embrace the use of blended learning as instructional strategy so as to improve student's performance in Mathematics.

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Introduction

Mathematics may be described as the fundamental of science. It is the branch of science that uses numbers and symbols, Numbers and Symbols are arranged using systematic mathematical rules. Mathematics may be broadly described as the science of space, time, measurement, quantities, shape and numbers and their relationships with each other (Popoola & Olofin, 2020). Certain qualities that are nurtured by mathematics are power of reasoning, creativity, abstract or spatial thinking, critical thinking, problem solving ability and even effective communication skills. Falebita and Olofin (2020) opined that mathematics enables children to develop knowledge of concepts such as understanding of number and numerical operations as well as knowledge of spatial concepts such as shapes and measurement. Today, mathematics pervades literally every facet of human endeavour and plays a fundamental role in economic development of a country.

Despite the values and importance of mathematics in secondary schools, the subject seems too difficult for the students to comprehend thereby leading to poor performance of the students in both internal and external examinations such as West African Examination Council (WAEC), senior school certificate examination (SSCE), national examination council (NECO) and national and business and technical examination board (NABTEB). There is ample evidence to show that all over the world, majority of Secondary School students' still see Mathematics as a dreadful subject, thereby affecting performance in Mathematics.

In Ekiti state, there was improvement in 2016, 2017 and 2018, as 59%, 70% and 90% of students who sat for Mathematics in Ekiti State in those years respectively passed at credit level and above (Ekiti State Ministry of Education, 2019). But the performance of students in Mathematics dwindled for 2019 and 2020 as 61% and 56% of students who sat for Mathematics respectively passed at credit level and above (Ekiti State Ministry of Education, 2021). There is need to find out strategies that can be used to sustain the earlier improvement experienced between 2016 and 2018.

Today, as the educational sector is faced with series of changes and reforms, it is good to reflect on matters concerned with mathematics and the dissemination of mathematics knowledge and lessons. Numerous teaching strategies have been developed which correspond to the accommodation of students need and diverse learning methods. One of such strategy involves the use of blended learning.

Blended learning is a teaching strategy that converts the curriculum into computerized topics and multimedia such as image and sounds to make the educational process more effective and valuable. The uniqueness of the blended learning is represented by its ability to use the refined techniques from both, e-learning and traditional method, thus, the output will be a version of the best from each method.

According to Kuo, et al (2014), blended learning is an approach that combines face-to-face interactions with technology-based learning. Blended learning can also be referred to as hybrid learning and it is based upon face-to-face interactions 67% of the time and technology interactions 33% of the time. Many educators have implemented this model into their classrooms to enhance effective teaching. The classroom may also be set up in a variance of ways. While the idea is to have the technology portion less than 50% of the time, teachers want to use the technology-based pieces as a way to enhance their instruction. Blended learning is a pedagogical approach that explicitly integrates online and face-to-face learning, and where students have meaningful interactions with their teacher with and without the mediation of electronic technology.



Blended learning is one successful approach to integrating technology, including mobile technologies, into standard classrooms (Moskal, Dziuban, & Hartman, 2013). Blended learning can provide a more personalized and student-centred learning experience while still allowing students to readily access teacher support. The importance of using the Internet and computers is gradually increasing in terms of the teaching of Mathematics. Activities carried out during the usual teaching hour are not sufficiently effective because of time constraints hence, with the blended learning model, students are able to carry out multimedia applications – which cannot be sufficiently taught during lessons - via the Internet. In addition, ability to see the syllabus content before coming to the class enables students to learn the concepts and thus to come to the class as prepared for the lesson (Olofin & Falebita, 2020). Students can discuss important subjects in the Internet environment (in forums) and establish communication both with their teachers and with other students.

The goal of blended learning is to combine the best features of in-class learning with the best features of online learning to deliver a valuable educational experience to students (Gilbert & Flores-Zambada, 2011). The purpose of the study therefore was to examine the effect of blended learning strategy on senior secondary school students' performance in Mathematics in Ekiti State. Specifically, the study:

- i. examined the effects of blended learning on students' performance in Mathematics; and
- ii. found out the performance of students taught mathematics using blended learning and those taught using conventional method before and after treatment.

Research Question

This research question was raised to guide this study:

- 1) What is the performance of students in mathematics?

Research Hypotheses

The following null hypotheses were generated for this study.

1. There is no significant difference in the performance mean scores of students taught using blended learning and those in conventional group before treatment.
2. There is no significant difference in the performance mean scores of students taught using blended learning and those in conventional group after treatment.

Methodology

The study adopted quasi – experimental of pre-test post-test control group design type (one experimental and one control groups). The study population consisted of all Senior Secondary School Two (SSS II) students in public secondary schools in Ekiti State. The sample included the class intact size of four public secondary schools in Ekiti State. A total sample of 114 students was selected from the four public secondary schools through multi-stage sampling procedure.

A self-designed instrument tagged Performance Test in Mathematics (PTM) was used by the researchers to collect data for this study. The instrument was divided into two sections namely section A and B. Section A sought for the socio-demographic characteristics of the students while section B was made up of 50 structured items. The instrument was validated by Tests and Measurement experts while the internal consistency of the instrument was established through Cronbach's Alpha statistics which yielded coefficient value of 0.831.

Blended learning strategy guide was designed by the researchers, explaining the activities of both teachers and the learners in the group. The content taught by the teacher and learnt by the students was stated in the strategy guide. The researchers took permission

from the principals of the sampled schools where the study was carried out. The consent of the research assistants (mathematics teachers) was sought before carrying out the study. The experimental procedure was divided into three stages: the pre-treatment, treatment and post-treatment stages.

The Performance Test in Mathematics (PTM) was administered on experimental and control groups as pre-test so as to determine the homogeneity of both groups. The same instrument though reshuffled was also administered as post-test after teaching the experimental and control groups for six weeks. Performance of students in pre-test and post-test were collated and subjected to descriptive statistics (frequency count, mean and standard deviation) and inferential statistics (t-test). All hypotheses were tested at 0.05 level of significance.

Results

Research Question 1: What is the performance of students in mathematics?

Table 1: Mean and standard deviation of pre-test and post-test scores of students exposed to blended learning and conventional strategies

Strategies	Test	N	Mean	S.D	Mean Diff.
Blended Learning	Pre Test	51	26.25	1.83	44.40
	Post Test	51	70.65	3.41	
Conventional	Pre Test	63	26.15	1.97	22.95
	Post Test	63	49.10	3.09	
Total		114			

From Table 1, it is shown that the mean difference in students' performance in Mathematics between pre-test and post-test scores for blended learning strategy is 44.40 and conventional method is 22.95. It appears that the use of blended learning and conventional strategies influence students' performance in Mathematics with blended learning strategy being the more effective method in the teaching of Mathematics. The graphical representation below further shows the more effective method in the teaching of Mathematics.

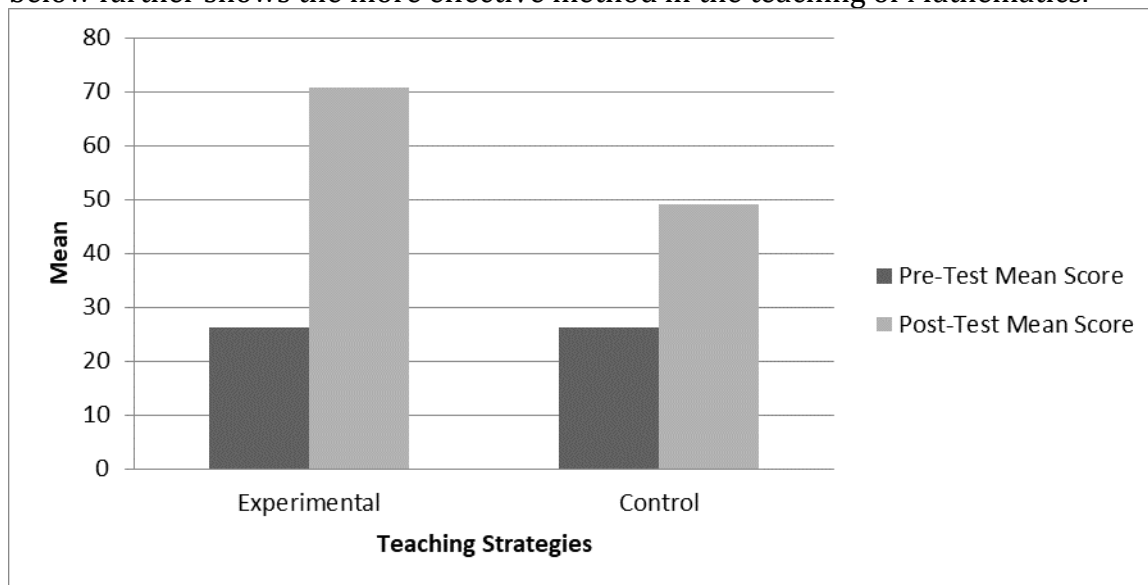


Figure i: Pre-test and Post-test mean scores of students exposed to blended learning and conventional strategies

Test of Hypotheses

Hypothesis 1: There is no significant difference in the performance mean scores of students taught using blended learning and those in conventional group before treatment.

Table 2: t-test analysis for Pre – test Mean Scores of Students in Experimental and Control Groups

Variations	N	Mean	SD	df	t _{cal}	P
Blended Learning	51	26.25	1.83	112	0.280	0.817
Conventional	63	26.15	1.97			

P>0.05

Table 2 shows that the t-cal value of 0.280 is not significant because the P value (0.817) > 0.05. This implies that null hypothesis is not rejected. Hence, there is no significant difference in the performance of senior secondary students taught mathematics using blended learning and those taught using conventional method before treatment. The students in both groups are homogeneous at the commencement of the study.

Hypothesis 2: There is no significant difference in the performance mean scores of students taught using blended learning and those in conventional group after treatment.

Table 3: t-test analysis for Post – test Mean Scores of Students in Experimental and Control Groups

Variations	N	Mean	SD	df	t _{cal}	P
Blended Learning	51	70.65	3.41	112	34.979	0.000*
Conventional	63	49.10	3.09			

*P<0.05

Table 3 shows that the t-cal value of 34.979 is significant because the P value (0.000) < 0.05. This implies that null hypothesis is rejected. Hence, there is significant difference in the performance of senior secondary students taught mathematics using blended learning and those taught using conventional method after treatment. The mean score showed a significant difference of 21.55 in favour of students exposed to blended learning strategy.

Discussion

The findings of this study revealed that, the performance of students in both experimental and control groups in pre-test were low and do not differ statistically. This finding 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 two groups involved in the study are equal. Consequently, any significant difference recorded afterwards would not be ascribed to chance, but to the specific treatment applied.

The findings of this study revealed that there was significant difference in the post-test mean score of students exposed to blended learning and conventional strategies. There was a better improvement in the performance of students resulting from their exposure to blended learning. This implies that the introduction of blended learning to the experimental group made them to perform better than the control group that was not exposed to conventional method. It implies that when blended learning strategy are used by Mathematics teachers, it is more effective than conventional method. The result is in consonance with the findings of Moskal, Dziuban and Hartman (2013) who concluded that students exposed to Blended learning will perform better than students exposed to conventional methods in Mathematics. Olofin (2020) was of the opinion that the use of conventional method to teach students in school diminishes their interest and performance in Mathematics.

Findings of Study

1. There was no significant difference in the performance mean scores of students taught using blended learning and those in conventional group before treatment.
2. There was significant difference in the performance mean scores of students taught using blended learning and those in conventional group after treatment.

Conclusion

Based on the findings of this study, it could be concluded that, the experimental and control groups were homogeneous at the commencement of the study. The use of blended learning enhanced better performance of students in Mathematics than the conventional strategy.

Recommendations

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

1. Mathematics teachers should embrace the use of blended learning as instructional strategy so as to improve student's performance in Mathematics.
2. Mathematics workshop on the use of blended learning instructional strategy should be organised for Mathematics teachers so as to adopt the strategy as recommended strategy of teaching Mathematics in Ekiti State.

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