Effect of Blended Teaching Method on Junior Secondary School Students' Academic Achievement in Basic Technology in Biu Educational Zone, Borno State Nigeria

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Abstract: The purpose of the study was to determine the effect of blended teaching method on Junior Secondary School Students Academic Achievement in Basic Technology subject in Biu Educational Zone of Borno State, Nigeria. Two research questions and two null hypotheses were formulated to guide the study. The study adopted quasi-experimental design of pretest, posttest nonrandomized, nonequivalent control group design. The population of the study was 22,968 Junior Secondary School students offering Basic Technology in 14 Government Secondary Schools in Biu Educational Zone of Borno State. Purposive sampling technique was used to select two Junior Secondary Schools for the study. The total sample size was 182 students in their JSS II. The instrument for data collection was developed by the researchers titled: "Basic Technology Achievement Test (BTAT)". The instrument was validated by three experts and 0.88 reliability index was obtained using Cronbach Alpha method. Mean statistic was used to answer the research questions while z-test and ANOVA were used to test the null hypotheses at 0.05 level of significance. Findings of the study revealed among others that mean achievement scores of students in the experimental group was higher than those in the control group; both males and females academic achievements increased significantly when taught using blended teaching method than those taught using lecture method. Based on the findings, the following recommendations were made: Government should ensure that teaching process in junior secondary schools in Borno State should not rely on the traditional pattern of instructional delivery but should incorporate blended learning in the process; teachers teaching basic technology subject should expose the students to various modes of blended supported learning management system to promote student-centered instructional approach, students 'autonomy to knowledge acquisition, and student-self-discovery learning.

Keywords: Blended Learning, Teaching Method, Junior Secondary School, Academic Achievement, Basic Technology

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1. Introduction

In a country, whether developed, developing or underdeveloped, its own system for training and educating its youth is peculiar to it. The purpose of education is not just to make a student literate but also to add rational thinking, knowledge and self-sufficiency. Such purpose of education is dynamic in nature as it encompasses many changes. In today's era, information and knowledge stand out as very important and critical input for teaching and learning (Kalaivani, 2015). In a classroom situation, students differ in terms of intellectual ideas and perception; they learn and understand more quickly and easily in different ways but these facts are not taken into consideration in traditional method of teaching (Umoh & Akpan, 2014).

Traditional method of teaching alone may not be suitable for individual requirements. Thus, there is need for innovative teaching method to cater for difference in learning styles. These could include mobile learning, flipped classroom, e-learning, and blended learning, among others.

Generally, blended learning aims to employ multi-educational methods to achieve the final goal behind education (Tsoi, 2009). The uniqueness of blended learning is represented by its ability to use advantages of both e-learning and traditional method. Thus, the output will be a version of the best from each method. Grahan (2006) stated that a stronger learning environment has emerged with combining the strongest aspects of the two available approaches to remove the deficiencies of traditional learning and Web-based learning. Blended learning can also be defined as integrating face to face learning and electronic learning or distance learning, using different learning theories, methodologies and techniques in the same place and supporting the learning with various online technologies during the learning process in the classroom (Rossett, 2002; Singh, 2003). However, Blended learning will provide a big convenience for the course to achieve its target by combining the face-to-face interaction in traditional learning and time, place and material richness provided by Web-based learning for better students' academic achievement.

Student achievement has become a hot topic in education today, especially with increased accountability for classroom teachers. The ultimate goal for any teacher is to improve the ability level and prepare students for adulthood and the world of work. Defining student achievement and factors, that affect progress is critical to successful teaching. Student achievement measures the amount of academic content a student learns in a determined amount of time. Each grade level has learning goals or instructional standards that educators are required to teach and will increase when quality instruction is used to teach the instructional standards. There are many variables, that can affect successful student achievement, but the most critical is classroom instruction. It is important to remember that not all students learn the same way or at the same rate, but each student has his/her own unique learning style. Teachers must use a variety of teaching methods and understand the background and individual needs of each student irrespective of their gender.

The issue of gender and gender stereotyping permeates every aspect of human endeavour. Okeke (2007) observed that the consequences of gender stereotyping cut across social, economic, political, and educational development, especially in the areas of science and technology. Despite the fact that females are underrepresented in relation to their male counterparts in science and technology subjects, Maduabam (2016) expected that the achievements of the few found doing the subjects can be compared to, that of their male counterparts. Even though, underrepresentation does not affect achievements, there have been

conflicting reports in respect to gender and achievement in science and technology (Ezeliora, 2016). Many researchers have provided reports that there are no longer distinguishing differences in the cognitive, affective, and psychomotor skill achievements of students in respect of gender. However, Croxford (2012); Kolawole, (2017) in their respective studies found that male students performed better than their female counterpart in the cognitive, affective, and psychomotor tasks.

2. Statement of the Problem

Students offering Basic Technology in Biu Education Zone of Borno State have been taught using traditional teaching methods. It is not certain if a combination of blended learning and lecture method could improve students' academic achievement in Basic Technology. It is based on this background that this study sought to determine the effect of blended teaching method on Students Academic Achievement in Basic Technology subject in Biu Education Zone of Borno State.

3. Purpose of the Study

The purpose of the study was to determine the effect of blended teaching method on Junior Secondary School Students Academic Achievement in Basic Technology subject in Biu Education Zone of Borno State. Specifically, the study sought to:

1. Determine the mean achievement scores of students in Basic Technology when taught using blended and lecture teaching methods
2. Compare the mean achievement scores of male and female students when taught Basic Technology using blended and lecture teaching methods

4. Research Questions

1. What are the mean achievement scores of students in Basic Technology when taught using blended and lecture teaching methods?
2. What are the mean achievement scores of male and female students when taught Basic Technology using blended and lecture teaching methods?

5. Hypotheses

HO1: There is no significant difference between the mean achievement scores of students in Basic Technology when taught using blended and lecture teaching methods

HO2: There is no significant difference between the mean achievement scores of male and female students when taught Basic Technology using blended and lecture teaching methods

6. Methodology

The study adopted quasi- experimental design of pretest, posttest nonrandomized nonequivalent control group. Owodunni (2011) stated that quasi-experimental research design investigates the possible cause and effect as well as relationship between two or more variables by the application of treatment which cannot be resolved by mere observation or description.

The model sketch of the design of the study is:

GP I: O1 x O3

GP II: O2 O4

Where:

GP I=Experimental group taught with Blended Learning Strategies (BLS) and

GP II=Control group taught with Conventional Lecture Method (CLM).

O1, O2, are pre-test scores of the two groups,

O3, O4arepost-test scores of the two groups,

x is the treatment for the experimental groups, while

O is the observations (Campbell in Duhu, 2006).

The study was conducted in Borno State of Nigeria. Borno state is located in Northeast part of Nigeria on latitude latitude 9^0 15' N and longitude 12^0 25' E. The population of the study comprised of all 22,968 Junior Secondary School students offering Basic Technology in 14 Government Secondary Schools in Biu Educational Zone of Borno State. Purposive sampling technique was used to select two Junior Secondary Schools in Biu Educational Zone of Borno State for the study. The total sample size was 182 students in their JSS II. The instrument for data collection was developed by the researchers titled; "Basic Technology Achievement Test (BTAT)". The achievement test consisted of 50 multiple-choice items with four (4) options lettered A-D, which were given, scores. The instrument was validated by three experts from the Department of Electrical Technology Education, Modibbo Adama University, Yola, Nigeria and after a trial test on 50 students at Government Day Junior Secondary School, Damaturu, Yobe State, a reliability index of 0.88 was obtained using Cronbach Alpha reliability method. Data collected for the study were analyzed using SPSS version 22 for windows and mean statistic was used to answer the two research questions while, the null hypotheses were tested using z-test and ANCOVA at 0.05 level of significance. To answer the research questions of the study, both pre-test and post-test mean scores of experimental and control groups were compared for mean difference. Higher mean score showed better achievements. The decision for testing the two null hypotheses of the study was that; when the calculated z-value was lower than the z-crit, the null hypothesis was accepted, conversely, the null hypothesis was rejected. ANCOVA was used to determine the gender interactive effect.

6. Results

6.1 Research Question One

What are the mean achievement scores of students in Basic Technology when taught using blended and lecture teaching methods?

Table 1: Mean and standard deviation of achievement score of students taught basic technology using blended and lecture teaching method

Groups	N	Pretest		Posttest		
		$\bar{X}$	SD	$\bar{X}$	SD	Mean Gain
Blended Teaching Method	93	36.38	16.70	63.61	15.62	27.23
Lecture Teaching Method	89	35.01	15.00	54.65	19.14	19.64
Mean Difference		1.37		8.96		7.59

Table 1 showed the pretest and posttest mean achievement scores of the two groups of students (Blended and Lecture Teaching Method). The result indicates that there is a rise in both groups mean scores in post-test. The mean score of the students exposed to blended learning method was ($\bar{X}$=63.61; SD= 15.62) while those exposed to lecture teaching method was ($\bar{X}$ =54.65; SD= 19.14). These translate to a mean difference of 8.96 in favour of the experimental group (blended teaching method). This means that, the mean achievement score of students in the experimental group was higher than those in the control group. This shows that blended teaching method is more effective in fostering student's academic achievement.

6.2 Research Question Two

What are the mean achievement scores of male and female students when taught Basic Technology using blended and lecture teaching methods?

Table 2: Mean and standard deviation of academic achievement score of male and female students taught basic technology using blended and lecture teaching methods

Teaching Method	Gender	N	Pretest		Posttest		
			$\bar{X}$	SD	$\bar{X}$	SD	Mean Gain
Blended Teaching Method	Male	62	31.37	13.09	68.12	12.98	36.75
(Experimental Group)	Female	31	27.33	11.68	54.29	11.73	26.96
Lecture Teaching Method	Male	65	29.78	10.11	50.58	11.45	20.80
(Control Group)	Female	24	27.08	11.39	48.08	11.30	21.00

The result of the analysis on Table 2 shows that both male and female students' achievement in the pretest was low with male having a mean score of 31.37 while the female scored 27.33 and their standard deviation was 13.09 and 11.68 respectively. Male and female students performed better with a mean score of 68.12 and 54.29 respectively in the posttest, realized for use of blended teaching, which were higher than that of lecture teaching method with mean scores of 50.58 and 48.08 for male and female respectively. Their standard deviation ranges from 11.30 -12.98. Both male and females' achievements on the subject have significantly increased with the use of blended teaching method. This indicates that blended teaching

method has been effective in the teaching of basic technology subjects irrespective of gender. However, male students' performances were higher than their female counterparts taught using blended teaching method. This means that use of blended teaching method enhanced academic performance for both male and female students, but male students performed better than their female counterparts.

6.3 Hypothesis One

There is no significant difference between the mean achievement scores of students in Basic Technology when taught using blended and lecture teaching methods

Table 3: z-test comparison of the mean achievement scores of students in the blended and lecture teaching method

Teaching Methods	N	$\bar{X}$	SD	z-cal.	z-crit.	Remark
Blended Teaching Method	93	63.61	15.62	6.93	1.96	Reject Ho
Lecture Teaching Method	89	54.65	19.14			

The result of the analysis in Table 3 reveals that the calculated z-value of 6.93 is greater than the critical z-value of 1.96 at 0.05 level of significant. Therefore, the Null hypothesis of no significant difference in the academic achievement of Basic Technology students taught with blended learning and conventional teaching method was rejected. This implies that there was a significant difference in the academic achievement of Basic Technology students taught with blended learning and those taught with conventional method. It can be concluded that the students in the experimental group had higher levels of academic achievement than control group. Therefore, blended teaching method proved to be more effective than the lecture teaching method

6.4 Hypothesis Two

There is no significant difference between the mean achievement scores of male and female students when taught Basic Technology using blended and lecture teaching methods.

Table 4: Summary of ANCOVA of significance of interaction effect of teaching methods and gender on students' achievement in basic technology

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	3959.929[a]	4	989.982	13.111	.000
Intercept	25434.920	1	25434.920	336.864	.000
Pretest	79.638	1	79.638	1.055	.306
Teaching Method	2947.665	1	2947.665	39.039	.000
Gender	178.217	1	178.217	2.360	.126
Teaching Method * Gender	1.058	1	1.058	0.014	.906
Error	13364.379	177	75.505		
Total	655832.000	182			
Corrected Total	17324.308	181			
a. R Squared = .229 (Adjusted R Squared = .211)					

The results of the analysis in Table 4 revealed that, there is no significant interaction between treatments (blended and lecture methods) and gender (male and female) on students' performance F = 0.01 (df 4, 181), P = 0.00. Since the computed p-value (0.91) is greater than 0.05 level of significant, therefore, the null hypothesis of no significant interaction is upheld and concluded that, there is no significant interaction between treatment (experimental and lecture methods) and gender (male and female) on students' achievement.

7. Study Findings

Based on the results presented, the following findings were made

1. Mean achievement scores of students in the experimental group were higher than those in the control group indicating that blended teaching method is more effective in fostering student's academic achievement
2. Both males and females' academic achievements increased significantly when taught using blended teaching method than those taught using lecture method
3. There was significant difference between the mean achievement scores of students in Basic Technology when taught using blended and lecture teaching methods
4. There was no significant difference between the mean achievement scores of male and female students when taught Basic Technology using blended and lecture teaching methods

8. Discussion of Findings

Findings of this study revealed that the mean achievement scores of students in the experimental group was higher than those in the control group indicating that blended teaching method is more effective in fostering student's academic achievement. This translates to a mean difference of 8.96 in favour of the experimental group. To determine whether this difference is statistically significant, the z-test confirms that there was a significant difference between the blended teaching method and lecture method in the achievement scores in favour of blended teaching method. This result may be attributed to the students' motivation and willingness of using blended learning, which is reflected in the perceived ease of use and acceptance scale. The result is consistent with some studies such as Omiola, Enuwa, Awoyemi & Adebayo, 2012; Gambari, et al., 2017; Almasaeid, 2014; Melton, et al. 2009; Nwoke, Akukwe & Nwanjor, 2014; Etim, 2017, who concluded that students performed better in blended teaching methodthan lecture method and reported that students preferred blended teaching method over lecture method. However, the result is in contrast with the results of Akkoyunu & Soylu (2008); Grandzol (2004); Vamosi et al. (2004); and Chen and Jones (2007) who found that there was no significant difference in the students' results in favour of blended learning.

Furthermore, the finding revealed that both males and females' academic achievements increased significantly when taught using blended teaching method than those taught using lecture method. The mean scores realized for both males and female students for the use of blended teaching method were higher than that of lecture method for male and female respectively. This means that use of blended teaching strategy enhanced academic performance of both the male and female students, but male students performed better than their female counterparts. To determine whether this difference is statistically significant, the z-test confirms that there is a significant difference between mean achievement scores in the blended teaching method in favour of male students. Based on that, there was significant difference between the level of students' academic achievement when taught using blended learning and lecture method by gender. This finding is in agreement with the findings of (Abidoye, 2015; Fakhir, 2015; Etim, 2017) who's in their individual results revealed that there was a significant difference between the academic achievement of male and female students in a blended learning class. However, the result is at variance with some studies such as (Ibrahim & Mehmet, 2014; Gambari, et.al, 2017) whose results revealed no significant difference between the academic achievement of male and female students in a blended learning class.

9. Conclusion

Based on the findings of the study, it was concluded that the use of blended teaching method in teaching and learning increased students' academic achievement especially among Junior Secondary School Student offering Basic Technology in Biu Educational Zone of Borno State. Though, the male academic achievement was higher than their female counterpart, but their academic achievement increased significantly. As such it could be concluded that blended teaching method can be used to teach both male and female student in Junior Secondary School.

10. Recommendations

Based on the findings presented, the following recommendations are made:

- Government should ensure that teaching process in junior secondary schools in Borno State should not rely on the traditional pattern of instructional delivery in relation to teaching technology courses, instead, blended teaching method should be incorporated, where the presence of an instructor is supported by the use of modern technology, which renders the learning process more flexible in terms of time and place.
- Teachers teaching basic technology subject in Biu Educational Zone of Borno State should expose the students to various modes of blended supported learning management system to promote student-centered instructional approach, students 'autonomy to knowledge acquisition, and student-self-discovery learning

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