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BLENDED LEARNING INSTRUCTIONAL STRATEGY AND JUNIOR SECONDARY STUDENTS' ACADEMIC ACHIEVEMENT IN BASIC SCIENCE IN OBALGA, RIVERS STATE

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Abstract
Efforts by stakeholders in education towards ensuring that Nigeria students show interest and concern in science cannot be proven to have yielded the much-expected results, as the quantum of students still performs poorly in science. This problem may have arisen from several factors including the teaching methods used by the Basic Science teachers at the basic level. This study investigates the effectiveness of the blended learning technique and lecture method on students' academic achievement in Basic Science in Junior Secondary Schools in Obio/Akpor LGA Rivers State. It embraced the quasi-experimental design. Three research questions and three null hypotheses guided the study. 216 Basic 8 (J.S.S. 2) students in four intact classes of two randomly selected Secondary Schools in OBALGA were used for the study. Two intact classes served as the blended learning technique group while the other two intact classes were the lecture method group. The instruments include the energy learning program (ELP) and the Students' Achievement Test in Energy (SATE). SATE is a 50-item multiple-choice objective test. SATE-1 was administered as a pre-test and SATE-2 as a post-test. Data obtained were analyzed using mean and ANCOVA and the results indicated that the blended learning strategy significantly improved students' achievement better than the lecture method. It was therefore recommended among others that teachers should incorporate a blended learning strategy in teaching basic science to students to captivate them to engage in learning and also enhance their success in the subject.

Keywords: Blended learning, Academic Achievement, Basic Science, Junior Students.

Introduction

The position of science in national development cannot be overemphasized. The growth and development in the developed nations of the Western and Eastern worlds such as Japan, South Korea, Malaysia, Singapore, India have long been attributed to science and technology and many more countries all over the world are striving towards developing or improving their technological expertise. For individuals to contribute meaningfully to the technological development of their country or society they need to possess appropriate scientific knowledge and skills and this can principally be attained via a concrete footing in science and technology education. Today, countries across the universe have embraced science education into their curricula. Olasehinde and Olatoye (2014) emphasized the importance of science education, stating that science education leads the globe towards a scientifically literate culture, which is necessary for the understanding of science, personal pursuance, and enthusiasms. The European Commission (2015) further states that knowledge of and learning about science is essential in grooming humans to be active and responsible citizens. Citizens that are creative and innovative, work collaboratively and be fully aware of the numerous challenges that society is confronted with.

There have been several studies conducted in Nigeria that have revealed that student performance in science is generally poor (Oludipe, 2012), and several reasons have been proposed for this, including poor teaching methodologies, negative attitude towards science subjects among students (King'aru, 2014), a lack of motivation among learners (Ngema, 2016), and a lack of resources. According to researchers who compared students' performances using different teaching methods, students' performances differed when different teaching methods were used (Okwuduba & Okigbo, 2018), and the performance of students of different ability levels and gender

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differed when their performances were compared using different teaching methods (Okwuduba & Okigbo, 2018; Owo & Ogologo, 2019; Ndirika, 2012; Oludipe, 2012)

Blended Learning, BL (also known as mixed or hybrid learning) was specifically chosen because it is a teaching style that combines the use of traditional educational methods with the application or use of technology to produce better students' learning outcomes. Studies have confirmed the value of technology intuition, as well as the advantages that institutions of learning stand to gain from the adoption of this kind of teaching style in their daily operations (Boe, 2018). Incorporating BL into the classroom motivates teachers to adapt their teaching approaches, and as a result, shifts learning towards a student-centred model as against a teacher-centred model. Susan & Chris (2015) claim that BL is more efficient than the traditional way in terms of classroom time utilization, entertaining students, allowing students to be more creative, and being involved in their education.

After being developed in the late 1990s as a new distance-learning teaching method to improve student learning and encourage teachers to vary their styles of instruction, BL has gained popularity as a way to shift learning from a teacher-centred learning model to a more student-centred model (Taylor, 1995). There are numerous definitions of BL, with the majority of them sharing a common feature: They describe it as a learning strategy that mixes several models of orthodox ways of learning and a variety of technological tools such as that interceded by computer (Graham, 2006; Macdonald & Scandrett, 2008).

As stated by Kagohara et al. (2010), employing multimedia in the form of simulation, video, encyclopedia, Encarta and science dry labs may be more effective than using textbooks, especially when dealing with complicated scientific themes and challenging ideas that are unknown to students. Researchers have put up an agenda that includes revolutionary and unique research problems for BL that have the potential to boost the potency of the learning process (Picciano 2006). In studies comparing BL to face-to-face classrooms, students' academic achievement and happiness have been found to increase (Dziuban & Moskal 2011; Means et al. 2013). Students' feeling of belonging has also been shown to enhance (Rovai & Jordan 2004). Dowling, Godfrey & Gyles (2003) discovered that BL can enhance both learning and teaching, resulting in students favouring it over traditional learning.

In a recent study on 89 pure science students in Senior Secondary School in Rivers State, Owo and Ihua-Maduenyi (2020) found the BL class exposed to the topics- heredity (in biology) and electrolysis (in chemistry) to be superior academically than the face-to-face class exposed to the same topics. Some empirical studies (Khader, 2016; Okaz, 2015) also support using BL in promoting students' academic achievement. Tosun (2015) and Kazu & Demirkol (2014), on the other hand, have revealed no significant differences between groups taught using BL strategies and groups taught using traditional methodologies. According to them, blended learning has no significant impact on student's academic progress.

Voyer and Voyer (2014), Chang (2008) and Else-Quest, Hyde & Linn, 2010; Abubaker and Bada (2012) examined disparities in performance connected to different science disciplines concerning gender gaps. These studies have revealed considerable achievement discrepancies between boys and girls in mathematics and science with boys doing better than girls while girls do better in literacy than boys (Penner 2008; Else-Quest et al., 2010). In a similar vein, Voyer and Voyer (2014) discovered a minor but significant female success that was greatest in languages and lowest in math and science courses. However, they concluded that " although gender disparities on performance tests follow largely traditional patterns, for whatever reasons, females usually have an edge on school grades regardless of the subject area" (Voyer & Voyer,2014). Others pointed out that these changes were not constant, Extensive studies on disparities in achievement based on gender gaps have been conducted in the United States of America and many other Western countries where there are secondary education data unlike in developing countries where education data is limited and hence few rigorous studies.

The Problem

To ensure that students demonstrate interest and concern in science and scientific-oriented programs, the Nigerian government has made significant efforts. However, these efforts have not yielded the outcomes that were anticipated, since many students continue to perform poorly in science. Possibly, this poor performance may have emerged as a result of the inability of Basic science to gain the interest of students due to several circumstances, one

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of which is the teaching approach often utilized by Basic Science teachers at the Junior Secondary School. Instead of encouraging student active participation in learning, the method fosters rote learning (i.e. learning by memorization and repetition rather than understanding), resulting in the necessity to employ or experiment with other learning tactics and approaches.

In addition, the degree to which BL can be beneficial in Basic Science is yet to be deeply investigated although some empirical studies support it. As a result, the target of this study was to assess the effectiveness of BL method on the academic achievement of students in fundamental science when compared to the lecture technique.

The following questions and hypotheses were stated to direct the study

RQ1: What is the mean gain in SATE of basic science students taught energy using BL and those taught using lecture method (LM)?

H_{O1}. Mean gain in SATE of basic science students taught energy using BL and those taught using LM do not differ significantly.

RQ2: What is the mean gain in SATE of basic science students taught energy using BL and those taught using LM with respect to gender?

H_{O2}. The difference in mean gain in SATE of basic science students taught energy using BL and those taught using LM is not significant.

Materials and Methods

The study embraced a quasi-experimental design. This design established cause-and-effect relation. It allows the researcher to expose one or more experimental groups to treatment or some treatments and observe the differences between these groups and another one or more groups called the control group(s). In this design, the researcher can manipulate one or more variables under his control. The study population is the entire Basic 8 (i.e. JSS 2) Basic Science students in public co-educational junior secondary schools in Obio/Akpor LGA, Rivers State. A sample of 216 students in Basic 8 (J.S.S. 2) was used for the study. The students were in their intact classes of two randomly selected Junior Secondary Schools. Two intact classes one from each of the schools were assigned to the BL group while the other intact class was assigned to the LM group.

To collect data for this study, Energy Learning Programs (ELP) and students' achievement tests in energy (SATE) 1 and 2 were used. ELP is a computer-assisted learning /tutorial program produced by the researchers on the topic-forms of energy. It has video clips with sound, images and text together aimed at clarifying the concepts and captivating students. SATE-1 served as the pre-test while SATE-2 was used as the post-test. Both SATE-1 and SATE- 2 are equivalent and contain 50 multiple-choice questions each on energy

SATE was administered to 40 students from non-participating schools and through the use of the test-retest method within two weeks between the first and the second test and correlating their scores using the Pearson Correlation technique, the reliability coefficient ($r = 0.81$) for SATE was obtained.

The study lasted for seven (7) weeks of teaching and learning exercise divided into 3 phases:

- One week of introduction during which SATE-1 was administered to the two instructional groups and data obtained was used as a covariate.
- Six weeks of intensive teaching and learning. The BL group was taught using both technology (computer-assisted instruction) and lecture method while the LM group was taught using the lecture method involving only face to face contact with the students. At the end of each topic, the students were given assignments.
- In the seventh week, the participants in the two instructional groups were given the SATE-2 as post-test.

In analyzing the data collected from the study, the researchers used the mean for answering the research questions and Analysis of Covariance, ANCOVA to test the hypotheses at .05 significant level.

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Results

Table 1: Mean gain in SATE of students taught energy using BL and those taught using LM

		Pretest		Posttest		Gain	
Groups	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
BL	102	43.726	8.199	56.753	7.313	13.027	0.886
LM	114	42.474	7.490	49.474	7.220	7.000	0.27

Table 1 showed that students taught using BL had a higher mean gain (mean = 13.027, SD = 0.886) than the students taught using LM (mean=7.00, SD = 0.27)

Table 2: ANCOVA of mean difference in SATE between students taught energy in basic science using BL and those taught using LM.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	3668.670[a]	2	1834.335	37.345	.000
Intercept	12225.602	1	12225.602	248.899	.000
Pretest	829.986	1	829.986	16.898	.000
Instr. Groups	2581.352	1	2581.352	52.553	.000
Error	10462.288	213	49.119		
Total	618651.000	216			
Corrected Total	14130.958	215			

a. R Squared = .260 (Adjusted R Squared = .253)

Table 2 showed that the mean difference is significant ($F_{1, 215}$ = 52.553, p= 0.000) since p<.05. Therefore, null hypothesis 1 was rejected.

Table 3: Mean gain in SATE of students taught energy using BL and those taught using LM with respect to their gender

			Pretest		Posttest		Gain	
Groups	**Gender**	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
BL	Male	49	45.000	7.558	58.306	5.734	13.306	1.824
	Female	53	42.547	8.655	55.283	8.310	12.736	0.345
LM	Male	58	43.138	6.512	51.345	6.711	8.207	0.199
	Female	56	41.786	8.388	47.536	7.274	5.750	1.114

Table 3 showed that male students taught using BL had a higher mean gain (mean =13.306, SD =1.824) than their female colleagues (mean = 12.736, SD = 0.345).The table also showed that male students that are taught using LM had a higher mean gain (mean = 8.207, SD = 0.199) than the female students taught using LM (Mean =5.750, SD =1.114).

Table 4: Ancova of mean difference in SATE between students taught energy in basic science via BL and LM classified by gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	4165.229[a]	4	1041.307	22.047	.000
Intercept	12580.435	1	12580.435	266.360	.000
Pretest	680.466	1	680.466	14.407	.000
Gender	3077.911	3	1025.970	21.722	.000
Error	9965.729	211	47.231		
Total	618651.000	216			
Corrected Total	14130.958	215			

a. R Squared = .295 (Adjusted R Squared = .281)

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The table showed that the mean difference is significant ($F_{1, 215}$ = 21.722, p= 0.000) since p<.05. Therefore, null hypothesis 2 was rejected.

Discussion of Findings

According to findings on hypothesis 1 there was a significant variation in the mean academic achievement test score between students who were taught using the BL method and students who were taught using the lecture approach. This finding is consistent with the findings of Owo and Ihua-Maduenyi (2020), Khader (2016), and Al-Hasan (2013), who reported significant differences in post-achievement scores in favor of the group that learned through blended learning. This considerable difference could be attributed to blended learning, which is likely to be more enjoyable and improve students' interest in learning as opposed to traditional lecture methods, which can be tedious and demotivating. In answer to study question 2 and hypothesis 2, the findings demonstrated a statistically significant difference in post-achievement outcomes based on gender. This conclusion contrasts with the findings of Godpower-Echie and Owo (2019) and Abonyi (2008), who found out that the discrepancies in science fulfilment between male and female students were not statistically important. Howbeit, according to Ajai and Imoko (2015), as well as Khader (2016), in their separate investigations, a significant variation in post achievement scores in favour of male students was discovered.

Conclusion and Recommendations

This study has revealed that BL is more effective as a teaching strategy than lecture method in promoting students' academic achievement, and so the researchers recommended that:

i. Teachers should learn to incorporate blended learning strategy in teaching school subjects (especially basic science and science-related courses) to captivate them to engage in learning and also enhance their attitude towards science learning, and grades in science tests.
ii. There is a need for schools to be equipped with ICT facilities to promote science teaching and learning via blended learning in schools.

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