

EFFECT OF BLENDED LEARNING STRATEGY ON STUDENTS' INTEREST IN GEOMETRY IN SENIOR SECONDARY SCHOOLS IN KOGI STATE, NIGERIA

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Abstract

The present study investigated the impact of Blended learning strategies on students' interest in geometry inside Senior Secondary Schools specifically in Kogi State, Nigeria. The investigation was directed by two research questions and their related null hypotheses. The study utilised a pretest-posttest control group quasi-experimental design. The population consisted of 12,703 (SS 2) Mathematics students from 29 public secondary schools and the sample size was 344 students. The Geometry Interest Scale (GIS) was employed as the main instrument for data collection. A face validation of the instrument was conducted by three experts from the Science Education Department, consisting of two experts from the Mathematics Units and one expert from Measurement and Evaluation and Education. Cronbach Alpha method was used to calculate the raw scores of the respondents acquired via GIS and a reliability coefficient 0.74 was obtained, which was deemed dependable for the study. Mean and standard deviation was used to answer the research questions, while analysis of covariance (ANCOVA) was used to test the Null hypotheses at a significance level of 0.05. The findings indicated that the implementation of Blended Learning techniques had a notable positive impact on students' interest in Geometry as compared to the conventional method. Therefore, it was recommended among others that mathematics teachers should employ blended learning teaching Strategy in order to augment students' enthusiasm for geometry.

Keywords: Blended, learning, strategy, performance, students

Introduction

Mathematics is an important subject that humans simply cannot do without because its forms the backbone of nearly all scientific and technological advancements. It allows for the development of long-lasting literacy skills in an individual and establishes a solid foundation for scientific and reflective thinking. Furthermore, it significantly contributes to the resolution of issues in

several sectors of any country, including Health, Agriculture, Finance, Education, Religion, Transportation, Communication, Power, and Housing (Enyonam, 2022). Mathematics offers unparalleled practicality, as a strong understanding of mathematics is essential for obtaining a high-quality degree in several fields including Chemistry, Physics, Engineering, Biology, Pharmacy, and others (Achimugu & Igbogwu, 2021). The subject as stated by Anaduaka and Hassan (2017), and Achimugu (2018) is the scientific study of identifying patterns. It also serves as the rational means of articulating concept, forms, amount, dimensions, organization, transformation and dynamism within the economic structures.

Geometry is one of the central topics in mathematics taught at the senior secondary school level. According to Iji and Obarakpo (2017), geometry is a fundamental and significant field within Mathematics that focuses on the examination of the dimensions, form, and placement of two-dimensional shapes and three-dimensional figures. Several geometric skills are applied in daily tasks such as map reading, object description, furniture arrangement for room fit, and estimating the required amount of fabric or building materials for a project (Sambo, 2015). Outside of the instructional setting, it functions as a fundamental basis for prospective professional paths, namely in the domains of science, technology, engineering, and mathematics (STEM), as well as in the realms of business, finance, education, and healthcare. Geometry plays a crucial part in the comprehensive growth of students fortifying cognitive capacities by fostering logical reasoning, problem-solving aptitude, abstract thinking, and critical analysis.

Levels of interest in geometry among secondary school students exhibit significant variation. While some students relish the challenge and satisfaction of the subject, others find it interesting. Many variables, such as previous exposure to the topic, the competence of the teacher, and the gender of the student, might impact the level of interest in geometry among students. According to Achimugu, Igbegwu, Delmang & Sunday (2022). Interest is referred to as the feeling or excitement accompanied by special attention to do something. Students who do not have interest in a particular subject would find it difficult to learn the subject.

Blended learning, as described by Bonk and Graham (2017), refers to educational methods that integrate traditional in-person teaching with computer-mediated training. Contemporary usage of the term blended learning generally refers to the integration of Internet and digital media with traditional classroom formats that necessitate the physical presence of both the teacher and students (Friesen, 2015). The distinguishing feature of blended learning is its capacity to include sophisticated methodologies from both e-learning and traditional approaches. Application of teaching methods has diverse

consequences for the attributes of both teachers and Student including the gender of the students.

In mathematics classroom setting, there are male and female students who participate in teaching-learning process, that serve as moderating variable called gender. Gender is a socially assigned characteristic that distinguishes between traits of femininity and masculinity. Studies such as Olasehinde, and Olatoye, (2014) and Muhammed, Achimugu, and Kanji, (2019) have confirmed the impact of gender on students' performance in geometry. Multiple scientific investigations have shown conflicting findings regarding the relationship between students' gender and their academic performance in Mathematics. Although specific researches have shown that there is no statistically significant disparity in the academic performance of students in geometry depending on their gender. (Olasehinde & Olatoye, 2014; Amogne, 2015). Ganley and Lubinski (2016) suggested that these disparities may stem from female student conforming to the gender stereotype of a 'good girl' in school, focusing primarily on tasks assigned by the class teacher. Therefore, they refrain from exploring alternative innovative or daring approaches that could optimize their problem-solving abilities in geometry.

This study has connection with the study of Indrapangastuti, Surjono, Sugiman, and Yanto, (2021) who conducted a study to determine the efficacy of the blended learning approach in mathematics learning in improving mathematical concept performance. The findings of the study revealed that the blended learning model is much more successful than the traditional learning model in improving students' performance on mathematical concepts. This suggests that incorporating blended learning into mathematics instruction can considerably increase students' proficiency with mathematical topics. Furthermore, Iji, and Obarakpo, (2017) found that blended learning is a useful solution for individuals attempting to study remotely during the COVID-19 lockdown, resulting in a significant increase in learning engagement. The study confirmed that blended learning improves students' academic performance in geometry.

Particularly shown in the Senior School Certificate Examination (SSCE) results published by the West African Examination Council (WAEC) Chief examiner from 2011 to 2023, low student academic performance in mathematics has been a recurring problem in Nigeria. This constant pattern shows difficulties for upper secondary school students in Nigeria in understanding basic ideas including geometry. Lack of interest, inactive learning, poor instruction, and a dearth of trained teachers are among the elements researchers find driving problems with mathematical education. Specifically in the Kogi education zone, the current study investigated the impact of blended learning Strategy on students' interest and geometric performance. The study fills in the void in the body of knowledge on the influence of these teaching strategies in the study environment.

The main purpose of this study was to investigate Effect of Blended learning Strategy on Students' Interest in Geometry in Senior Secondary Schools in Kogi State. Specifically, the objectives of the study was to determine the: effect of blended learning strategy on interest of students in geometry; effect of blended learning on the interest of male and female of senior secondary school students in geometry.

Research questions

The following research questions guided the study:

1. What is the difference in the mean interest rating scores of students when taught geometry using blended learning strategy and conventional method?
2. What is the effect of gender on the mean interest scores of students' when taught geometry using blended learning strategy?

Hypotheses

The following hypotheses were stated and were tested at 0.05 level of significance.

H₀₁: There is no significant difference in the mean interest ratings scores of students in Geometry when exposed to blended learning and Conventional method.

H₀₂: There is no significant difference in the mean interest ratings of male and female students' taught geometry using blended learning instructional strategy.

Methodology

The study used a pretest-posttest control group quasi-experimental design. This design was selected because it allows one to evaluate the efficacy of interventions by choosing groups with pre-existing traits (Achimugu, Mohammed, Enefu, & Offor, 2024). The population for the study was 12703. The sample size consisted of 344 SSII mathematics students in Kabba Bunu and Yagba East Education Zone Area of Kogi State, using multi-stage sampling method. The respondents were classified into experimental and control groups with total of 344 respondents. The experimental group was subjected to blended learning, while the control group was subjected to conventional teaching method. The instruments used for the study were Geometry Performance Test (GPT) and Geometry Interest Scale (GIS), which were validated by experts. The (GIS) Scored using Likert Scale of Strongly Agree (4); Agree (3); D: Disagree (2); SD: Strongly Disagree (1); The reliability coefficients of (GPT) using Richardson 20 formula yielded 0.88, while (GIS) using Cronbach Alpha approach stood at 0.74. The results were analyzed using descriptive and inferential statistics.

Results

Research Question One: What is the difference in the mean interest rating scores of students when taught geometry using blended learning strategy and conventional method?

Table 1 Mean Interest Scores of Students taught geometry using blended learning strategy and conventional methods

Method	Pre test		Posttest			Mean gain
	N	\bar{X}	SD	\bar{X}	SD	
Blended Learning	115	35.87	4.69	50.84	6.62	14.97
Conventional Method	120	20.32	4.97	30.55	4.40	10.23

The results in Table 1 indicate that students who received instruction in Geometry utilising the blended learning strategy (BLS) had an average interest score of 35.87 (SD = 4.69) at the pretest and an average interest level of 50.84 (SD = 6.62) at the posttest. The average gain score was 14.97. Moreover, the students who were instructed in Geometry using the traditional approach had an average interest score of 20.32 (SD = 4.97) before the lesson, and an average interest score of 30.55 (SD = 4.40) after the lesson, with an average increase of 10.23. Conversely, the higher gain ratings of 14.97 for the groups using blended learning techniques indicate that blended learning instructional strategies (BLS) enhanced students' interest more effectively than the traditional approach. Suggesting that the use of blended learning strategies (BLS) resulted in a favourable impact on the average interest scores of students in the subject of Geometry. The variation in the proximity of standard deviation among the three groups suggests that the respondents exhibited homogeneity in their answers to interest items.

Research Question Five: What is the effect of gender on the mean interest scores of students when taught geometry using blended learning strategy?

Table 2: Mean Interest Ratings Scores of Male and Female Students Taught Geometry Using Blended Learning Strategies

Gender	N	Pretest		Posttest		Mean Gain	Mean Difference
		\bar{x}	SD	\bar{x}	SD		
Male	160	38.27	4.30	52.84	4.66	14.57	9.20
Female	184	37.59	4.82	42.96	7.34	5.37	

The data shown in Table 2 display the impact of gender on the average interest ratings of students who were instructed in geometry utilizing blended learning strategy. The results indicate that male students had a pre-test mean interest ratings score of 38.27 (0.30) and a post-test mean interest ratings score of 52.84 (4.66). Female students had a pre-test mean interest ratings score of 37.59 (4.82), followed by a post-test mean interest ratings score of 42.96 (7.34). Analysis indicates that male students performed better than their female

counterparts, achieving a mean increase of 14.57 compared to 5.37 for female students. This results in a mean difference of 9.20 in favour of the male counterpart.

H₀₁: There is no significant difference in the mean interest ratings scores of students in Geometry when exposed to blended learning and Conventional method.

Table 3: Analysis of Covariance (ANCOVA) of Difference in the Mean Interest Ratings of Students in Geometry When Exposed to Blended Learning and Conventional Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	D
Corrected Model	8242.011 ^a	2	4121.005	104.676	.000	.380	
Intercept	7412.684	1	7412.684	188.286	.000	.356	
Pretest Interest	439.391	1	439.391	11.161	.001	.032	S
Methods	7547.785	1	7547.785	191.717	.000	.360	S
Error	13424.940	341	39.369				
Total	799623.000	344					
Corrected Total	21666.951	343					

Note: S = Significant, NS = Not Significant and η^2_p = partial eta squared
Table 3 displays the ANCOVA of the variation in the mean interest ratings of geometry students in geometry under blended learning instructional strategy and conventional approach. At $F = 191.717$, $p = 0.00$, $\eta^2_p = 0.360$, the outcome was statistically significant. The null hypothesis was disproved since the related probability value of 0.00 is smaller than 0.05 specified as level of significance. Therefore, inference is that, when exposed to blended learning instructional strategy and conventional method in favour of blended learning strategy with high mean, the mean interest ratings of students in geometry show a statistically significant difference. The outcome further revealed the effect size ($\eta^2_p = 0.360$), which implies thirty six percent (36%) variance in the mean interest ratings of students in geometry when exposed to explained by blended learning instructional technique.

H₀₃: There is no significant difference in the mean interest ratings of male and female students' taught geometry using.

Table 4. *Analysis of Covariance (ANCOVA) of the Difference between the Mean Interest Ratings Scores of Male and Female Students' Taught Geometry Using blended learning strategy*

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta Dec.
Corrected Model	8770.237 ^a	3	2923.412	77.071	.000	.405	
Intercept	7558.547	1	7558.547	199.268	.000	.370	
PretestInt	391.524	1	391.524	10.322	.001	.029	
Methods	16.930	1	16.930	.446	.505	.001	NS
Gender	528.226	1	528.226	13.926	.000	.039	S
Methods*Gender	.000	0	.000	.000	.520	.140	NS
Error	12896.713	340	37.932				
Total	799623.000	344					
Corrected Total	21666.951	343					

Note:S = Significant, NS = Not Significant and η^2_p = partial eta squared

Table 4 displays the results of an analysis of covariance (ANCOVA) comparing the mean interest ratings of male and female students in geometry classes that used Blended learning technique. At $(F) = 0.00$, $p=13.926$, and $\eta^2_p = 0.039$, the outcome was deemed statistically significant. With a probability value of 0.000, which is lower than the significance level of 0.05, the null hypothesis was rejected. The results show that the mean interest ratings of male students in geometry taught utilising the Blended learning technique were significantly higher than those of female students. The findings also demonstrated an effect size ($\eta^2_p = 0.039$), suggesting that alternative tactics can account for 39% of the variation in the mean interest ratings of male and female students' taught geometry utilizing Blended learning.

Discussion of Findings

On the basis of the interpretation of the results and the analysis of the data, the following discoveries were discovered.

The findings of the study indicated that there was a significant difference in the mean interest ratings of students in geometry when they were exposed to blended learning strategy and conventional method with blended learning strategy having higher means than the conventional approach.

The finding also indicated that there was a statistically significant difference in the mean interest ratings of male and female students who taught geometry using a blended learning Strategy with male students had higher mean ratings than the female students.

The study revealed that the group exposed to blended learning strategy did better than those taught using conventional method. This results was in agreement with the results of Indrapangastuti et al. (2021), Attard and Holmes (2020), who found out that blended learning strategy improves students' interest in geometry than the conventional methods of teaching. The results revealed that male students's performed better in geometry than female counterparts. This result was also in agreement with the results of Oribhabor (2020), Adeyemo, Ogunkola, and Akinola, (2021) and Allahnana, Usman (2018), who found out that male students performed better than female counterparts, when expose to blended learning than the conventional method.

Conclusion

The results of the study indicated that the mean interest ratings of students in geometry were statistically significantly different when exposed to the blended learning strategy and conventional method with blended learning strategy being favored. Based on the results of the study, there was a statistically significant difference in the mean interest ratings of male and female students who were taught geometry using Blended learning, with the male counterpart significantly higher.

Recommendations

The subsequent recommendations were formulated based on the results of the investigation.

1. Geometry teachers should use blended learning methods to make geometry more interesting and improve students' overall performance in the subject.
2. School administrators should encourage the use of blended learning to ensure equal participation and performance between male and female students in geometry.

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