

**EFFECT OF COLLABORATIVE LEARNING STRATEGY ON
STUDENTS' INTEREST IN GEOMETRY AMONG SENIOR
SECONDARY SCHOOLS IN ZARIA METROPOLIS, KADUNA STATE,
NIGERIA**

**NWAFOR, Mary Chizoba¹, TSOHO Mohammad² and ALIYU, Umar
Abubakar³**

^{1&2}**Department of Science Education,
Ahmadu Bello University, Zaria-Nigeria**

³**Department of Science Education,
Kaduna State University³**

Corresponding Author: nwa4mary21@yahoo.com¹

Abstract

This study aimed to examine the impact of the collaborative learning strategy on students' level of interest in geometry inside senior secondary schools located in Zaria Metropolis, Kaduna State, Nigeria. The study utilised a pre-test, post-test, quasi-experimental design. The researchers employed the Simple Random Sampling Technique to choose two co-educational schools from the population for the purpose of constituting the sample. The study's sample comprised 126 pupils, with 61 being male and 65 being female, selected from two distinct schools within the zone. The data collection tool employed in this study was the Student Geometry Interest Inventory (SGII). The dependability of the SGII was determined to be 0.88 using the Cronbach Alpha reliability coefficient. The research inquiries were addressed through the utilisation of mean and standard deviation calculations, while the null hypotheses were assessed at a significance level of 0.05 utilising independent sample t-test statistics. The findings of the study indicated that students who were instructed in geometry through the implementation of a collaborative learning strategy had a higher level of interest in the subject compared to those who were taught using traditional instructional methods. The study further demonstrated that there was no significant difference in interest ratings between male and female students in the experimental group. Based on the results obtained from this study, it is advisable to provide training for teachers and arrange workshops and seminars specifically tailored for mathematics educators. This training should focus on equipping teachers with the necessary skills to effectively

implement the Collaborative Learning Strategy in their mathematics instruction, among other strategies.

Keywords: Mathematics, Geometry, collaborative Learning Strategy, gender, interest.

Introduction

Mathematics is widely regarded as the fundamental underpinning of all scientific disciplines, owing to its ability to facilitate the comprehension and resolution of various mathematical operations such as addition, subtraction, multiplication, and division. Consequently, the acquisition of a comprehensive understanding of these mathematical concepts enables individuals to effortlessly tackle everyday issues and engage in various activities (Salau, 2000). According to a study by Setidisho (2006), mathematics holds a key position as a foundational science and is essential for understanding other educational disciplines. The speaker emphasised the evident prominence of this issue, highlighting its unparalleled influence within several fields of research. Ajani, Areelu, and Odeyemi (2011) assert that mathematics holds significant value in the daily endeavours of individuals. Furthermore, Roy (2011) noted that mathematics is widely recognised as an interdisciplinary language and tool that has significant importance inside the formal educational system. Despite its significance, mathematics is perceived as a challenging and uninteresting discipline by a considerable number of students (Nwafor, Ibrahim, & Ambrose, 2018). The importance of mathematics in cultivating adaptable and innovative graduates who are essential for fostering economic growth cannot be overstated. According to Odusoro's position, as cited in Nwafor et al. (2018), it is asserted that a comprehensive understanding of science is incomplete without the incorporation of mathematics. Hence, the inclusion of mathematics in the secondary school curriculum in Nigeria holds significant implications for scientific advancement. Nonetheless, it is discouraging to observe that research and data derived from esteemed National Examination Bodies such as the West African Examination Council (WAEC) and the National Examination Council (NECO) have consistently indicated subpar academic achievement in this particular topic (Nwafor et al., 2018).

The subpar academic achievement is particularly evident in the field of geometry. Geometry is a discipline within the field of mathematics that is concerned with the study of forms, dimensions, and spatial properties. Art, architecture, engineering, robotics, land surveys, astronomy, sculpture, space, nature, sports, mathematics, and automobiles are among the several domains in which engineering and technical growth are prominently observed (Bolaji, Korau, & Timayi, 2015). Geometry is a

branch of mathematics that is concerned with the investigation and analysis of various geometric figures and their properties. The geometric forms can be classified as either two-dimensional or three-dimensional shapes. Geometry is a fundamental subject that is introduced and taught at several educational levels, ranging from basic to postsecondary education.

However, most students find geometry boring therefore absent themselves in geometry lessons. Those who stay in the lessons pay little attention to the teacher. As a result, most students never learn or practice geometric problems on their own and concluded that it is too difficult. They prefer not to answer problems on geometry in examinations (Nguuma, 2010). These perceptions among other factors compel the students to be afraid and finally lose interest in geometry which has a negative effect on their performances. Haven't discovered that some methods used in teaching and learning of science subjects are ineffective and devoid of challenging and creative activities, Okebukola in Sangowawa (2019) called for the use of an instructional strategy that could involve use of concrete activities to enhance learning among learners. Teachers need to engage the students in a collaborative learning environment which encourages social interaction among students.

In the meantime, Zakariyya (2014) says that the collaborative learning method gives students a chance to share their own unique ideas, talk to their classmates, and learn from each other. One of the best ways to get students to learn actively is to use the collaborative learning approach. This is a way of teaching where students work together in small groups to reach a shared goal (Gokhale and Ishaq, 2015). As a result, students who work together to learn are responsible for both their own learning and the learning of others. This means that the success of one student helps other students succeed. As a result, collaborative learning involves creating a casual space where students can work together on a specific job, talk and agree on solutions to problems, and interact with each other (Ishaq, 2015). Concerns have also been raised about the role of interest as a variable in how well students learn mathematics in the current study. Shabani (2006) said that excitement is a stimulus that makes action stronger. Interest has a big impact on how well students remember and retrieve information. An interested person is more likely to become highly competent and get good feedback from others (Bolaji et al., 2015). There are many things that can affect a student's interest in math, such as their family, school, peers, first grade teacher at all levels, the size and look of the textbook (by adding math puzzles), the behaviour of previous math teachers, doing activities in math class, researching math topics and titles, and studying. When students are learning math, gender is another factor that needs to be taken into account to make sure they do well. As a bodily difference and a social label, gender tells us what groups of

people are male and female. For decades, people have talked about the link between a student's gender and how well they do in school (Elittle, 2005). Gender differences in math skills have caused a lot of debate in the education field, and study papers show that boys' and girls' math skills are very inconsistent in school (Sprigler & Alsup, 2003). Researchers who have been studying this topic for a long time have found that boys are always better at math than girls (Mullis, Martin, Gonzalez, Gregory, & Garden, 2000). In early studies (Fennema & Sherman in Gallagher & Kaufman, 2006), it was found that boys did better than girls in math at the junior and senior high school levels. However, boys and girls had very different views about math. The authors of Gallagher and Kaufman (2006) agreed that boys are better at and more interested in math than girls. They did say, though, that the reasons for these differences are not known. Math is hard to teach and learn right now because students keep failing external tests. The fact that a lot of Nigerian students fail math at all levels of schooling is a big problem for the country. Not being interested in or scared of math makes it harder to pass an exam. Math is an important subject in science and information-based classes, as well as in health and social science. However, students have consistently done poorly on both internal and external tests in this field. Teachers of math are trying to figure out what the main problems are that make it hard to teach and learn math in schools. Over the years, experts have seen that students do poorly in math, especially geometry (Ibrahim and Musa, 2023; Olorunnishola, 2023). This is what made this study necessary. So, this study looked into how a joint learning approach affected the interest in geometry among senior secondary school students in Zaria Metropolis, Kaduna State, Nigeria.

Research questions

This study was guided by the following research questions:

1. What is the difference between the mean interest rating of students in the experimental and control group before treatment?
2. What is the mean interest rating of students exposed to collaborative learning strategy and those exposed to the conventional method?
3. Which gender will have higher level of interest rating among students taught geometry using collaborative learning strategy?

Research Hypotheses

The following research hypotheses were tested at 0.05 level of significance:

H₀₁: There is no significant difference in the mean interest rating of students in the experimental and control group before treatment.

H₀₂: There is no significant difference in the mean interest rating of students exposed to collaborative learning strategy and those exposed to conventional method in geometry.

H₀₃: There is no significant difference between the mean interest ratings of male and female students taught geometry using collaborative learning strategy.

Methodology

The study adopted a quasi-experimental control group design employing pre-test and post-test which was recommended by Shittu, (2013). Quasi-experimental design was adopted because the researcher has no total control over the study subjects. The study involved two groups; one experimental group and one control group which was drawn from the population of senior secondary class two (SSII) in Zaria metropolis, Kaduna State. The experimental group was taught geometry using CLS while the control group was taught geometry using the conventional method. The population of the study consists of 8,556 senior secondary school year two students in the study area. The schools are located in an urban and rural areas which were made up of both single and co-educational. The sample size for the study was 126 Senior Secondary School year two Students comprises of 61 male and 65 female selected from the two schools using simple random sampling technique.

The instrument used for the study was Students Geometry Interest Inventory (SGII). It consists of two sections: Section A and B, Section A was for students' bio data information while Section B consisted of thirty (30) items interest scale. The instrument was designed to assess students' interest in geometrical concepts skills. Each item was rated on a five-point Likert scale with the positive statements response as Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), Strongly Disagree (SD) and were coded as 5, 4, 3, 2 and 1 respectively. It was validated by two experts in Mathematics education A.B.U., Zaria. The reliability coefficient of Students Geometry Interest Inventory was computed using Cronbach Alpha and the reliability of 0.88 was obtained. The data collected were subjected to both descriptive and inferential statistics. The research questions were answered with the use of mean and standard deviation while the research hypotheses were tested using t-test statistic.

Results

The results of the study were obtained from the research questions answered and hypotheses formulated for the study;

Research Question One What is the difference between the mean interest rating of students in the experimental and control group before

treatment? Summary of the mean and standard deviation of the students' interest level is presented in Table 1.

Table 1

Mean and Standard Deviation of Students' Interest level in Geometry of both the Experimental Group and Control Group before Exposure to Treatment.

Group	N	Mean	Std. Deviation	Mean Dif
Experimental	67	33.41	11.07	
				0.88
Control	59	32.53	10.54	

The result in Table 1, shows the mean and standard deviation of the students' interest level in geometry between the experimental group and the control group before exposure to treatment. The results revealed that the experimental group had the mean score of (33.41) while the control group had the mean score of (32.53). The mean difference between the experimental group and the control group is 0.88 which signified that the two groups are equivalent.

Null Hypothesis One:

There is no significant difference in the mean interest rating of students in the experimental and control group before treatment. This was analysed using Independent Sample t-test, the summary of the result is presented in Table 2:

Table 2

Independent sample t-test analysis on the students' pre-test scores in Experimental and Control group before treatment

Group	N	Mean	SD	Df	t-value	P-value	Remark
Experimental	67	33.41	11.07		1.25	0.12	**
				124			
Control	59	32.53	10.54				

**Not Significant at $p > 0.05$

The independent sample t-test result in Table 2, shows that the difference in the test scores between experimental group (N=67, M=33.41, SD=11.07) and control group (N=59, M=32.53, SD=10.54) were statistically not significant. t-value = 1.25 and

the p-value of 0.12 was greater than $\alpha \leq 0.05$. Based on this result, the null hypothesis was retained. This means that there is no significant difference in the mean interest rating of students in the experimental and control group before treatment. Therefore, both the experimental and the control group have similar interest rating in geometry before the treatment.

Null Hypothesis Two:

There is no significant difference in the mean interest rating of students exposed to collaborative learning strategy and those exposed to conventional method in geometry. This was analysed using Independent Sample t-test, the summary of the result is presented in Table 3.

Table 3

Independent sample t-test analysis on the students' post-test in the Experimental and Control group after treatment

Group	N	Mean	SD	Df	t-value	P-value	Remark
Experimental	67	55.18	9.23	124	9.55	0.00	*
Control	59	36.67	13.04				

*Significant at $p \leq 0.05$

The independent sample t-test result in Table 3, shows that the difference in test scores between the experimental group (N=67, M=55.18, SD=9.23) and control group (N=59, M=36.67, SD=13.04) were statistically significant. t-value = 9.55 and the p-value of 0.00 was less than $\alpha \leq 0.05$. Based on this result, the null hypothesis was rejected, this means that there is a significant difference in the mean interest rating of students exposed to collaborative learning strategy and those exposed to conventional method in geometry. Since the mean score of the experimental group is higher than the control group it is therefore justifiable to say that Collaborative Learning Strategy increased the interest of secondary school students in geometry than the conventional method.

Null Hypothesis Three:

There is no significant difference between the mean interest ratings of male and female students taught geometry using collaborative learning strategy. This was analysed using Independent Sample t-test, the summary of the result is presented in Table 4:

Table 4

Independent sample t-test analysis on male and female students' interest in Geometry within the Experimental group

Gender	N	Mean	SD	Df	t-value	P-value	Remark
Male	34	71.04	12.76	65	1.86	0.08	**
Female	33	67.95	12.08				

**Not significant $p > 0.05$

The result in Table 4, showed an independent sample t-test that the difference in test scores between the male students (N=34, M=71.04, SD=12.76) and the female students (N=33, M=67.95, SD=12.08) were statistically not significant. t-value = 1.86 and the p-value of 0.08 was greater than $\alpha \leq 0.05$. Based on this result, the null hypothesis was retained, this indicated that there is no significant difference between the mean interest ratings of male and female students taught geometry using collaborative learning strategy. Thus, Collaborative Learning Strategy increases the interest of both male and female students in geometry.

Discussion

The result of the study showed that, there is a significant difference between the mean interest rating of students exposed to Collaborative Learning Strategy (CLS) and those exposed to the Conventional Method (CM). This implies that the experimental group exhibited a higher level of interest in geometry than the control group when taught geometry with collaborative learning strategy. It can be deduced from this result that, the Collaborative Learning Strategy (CLS) offered the students an opportunity to socialize and interact with their team members which led to their high interest in geometry. Abraao (2006), suggest that when students work together to construct a collective Mathematics view within zones of proximal development, they act to discuss solution strategies using collaborative conversations to construct and reconstruct their reasoning which gives them higher interest ability. The result agrees with the findings of Mosley, Ardito and Scollins (2016) who observed that there was a significant difference in the mean interest levels of students taught using collaborative learning instructional strategy with those taught using conventional method.

The result of the present study differed from the result obtained from Muoneme (2015), who investigated the effects of cooperative learning instructional strategy on students' interest. The result shows that no significant difference was recorded in the mean interest scores of the students. More so, the present study disagreed

with Twan (2022) who discovered that there was no significant difference in the mean ranks of the students taught using cooperative learning strategy with those taught using conventional method.

In addition, the result of the present study reveals that there is no significant difference between the interest rating level of the male and female secondary school students taught geometry using Collaborative Learning Strategy (CLS). This is in line with the finding of (Chianson, Kurumeh and Obida, 2011) and Nejem and Muhanna, (2014) which shows that when participants become both visually and physically engaged in a collaborative learning environment, both male and female develop higher interest which leads to better performance. The reason for the equal academic performance and interest of male and female students is the Collaborative Learning Strategy which may not be separated with the fact that both male and female see themselves as equals and capable of actively collaborating in classroom activities. Ogunboyede (2003) in a study of sex difference and students' performance found that boys are not better than girls, in terms of educational performance and interest. The finding of the present study disagrees with Ezirim (2006); Dhimar and Patel (2013); Duyilemi and Bolajoko (2014) who observed that male students had higher interest level than their female counterparts in the experimental group.

Conclusion

Based on the findings from the study, it was concluded that Collaborative Learning Strategy enhanced students' interest in geometry more than conventional method. Collaborative learning strategy encourages sharing of ideas among students, promoted affability and friendliness in the classroom which made the lesson interesting for the students. Therefore, teachers should be discouraged on the use of conventional method of learning.

Recommendations

Based on the findings of the study, the following recommendations are made;

1. The application of Collaborative Learning Strategy (CLS) in teaching of geometry has shown that it is gender friendly thereby increases the interest of both male and female students in learning geometry.
2. Curriculum planners and developers should adapt Collaborative Learning Strategy by introducing it into the Mathematics curriculum especially in the teaching of geometry.
3. Teachers should employ Collaborative Learning Strategy in geometry, applied it in teaching other aspects of Mathematics at all levels of senior secondary schools.
4. Training and re-training of teachers should be encouraged on the use of Collaborative Learning Strategy in Mathematics classes.

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