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EFFECT OF SCAFFOLDING LEARNING STRATEGY ON TEST-ANXIETY OF STUDENTS IN GEOMETRY AMONG SENIOR SECONDARY SCHOOL IN ZARIA METROPOLIS, KADUNA, NIGERIA.

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Abstract

The study investigated the Effect of Scaffolding Learning Strategy on Test-anxiety of Students in Geometry among Senior Secondary School in Zaria Metropolis, Kaduna, Nigeria. A pre-test post-test quasi experimental design was adopted for the study. Simple Random Sampling Technique was used to select two co-educational schools from the population as the sample. The sample of the study consisted of 122 students (60 males and 62 females) from two different schools in the Zone. The instrument used for data collection was Geometry Test-Anxiety (GTA) which was adapted from Ahmad, (2016). The GTA had a reliability of 0.95 using Cronbach Alpha reliability coefficient. The research questions were answered using mean rank and mean rank difference while the null-hypotheses were tested at 0.05 level of significance using Mann-Whitney U-teststatistic. The results of the study revealed that students taught geometry using scaffolding learning strategy had reduction in their level of test-anxiety towards learning of geometry concepts than those taught using the conventional method. The study also revealed that both male and female students in experimental group had equal levels of test-anxiety when taught geometry using Scaffolding Learning Strategy.Based on the findings of this study, it was recommended that teachers should employ

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Scaffolding Learning Strategy in teaching geometry as well as in teaching other aspects of Mathematics at all levels of senior secondary schools.

Keywords: Mathematics, Geometry, Scaffolding Learning Strategy (SLS), Gender and Test-anxiety.

INTRODUCTION

The significance of mathematics has been a recurring theme across cultures and societies throughout recorded history, underscoring its importance in human understanding and progress. Mathematics is a practically and activity-oriented physical science that deals with numbers, forms, and everyday situations by using abstract symbols, axioms, and facts(Salau, 2000). Mathematics is also defined as the science of numbers, amounts, forms, and spaces (Chukwu, 2010). Moreso, according to Unodiaku (2012), mathematics is a crucial instrument for any country's scientific and technological advancement. Meanwhile, geometry is one of seven main areas of mathematics that are taught in Nigerian secondary schools.

Geometry is a branch of Mathematics that deals with the learning of properties, measurement and relationships of points, lines, angles, and shapes. Geometry is an aspect of Mathematics which deals with the study of different shapes. The shapes can either be plane or solid shapes.It is regarded as the foundation of engineering and technological advancement since it is present in many fields, including robotics, land surveys, astronomy, sculpting, space, nature, sports, mathematics, automobiles, and much more (Nguuma, 2010).

The concept of geometry is taught in schools right from primary to tertiary level (Yosoff, 2013). However, most students find geometry boring therefore absent themselves in geometry lessons and 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 (Bolaji, Korau &Timayi, 2015). 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. Performance as a variable in students' learning has been a matter of concerned in the present-day research.

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Popoola (2010) ascertained that academic performance is a function of various factors such as method of teaching, teachers' qualifications, child's home background, school environment, attitude, interest among others. In spite of stakeholder's interventions, the performance of students in Mathematics is still below average (Nwafor, 2017). Many factors are responsible for the poor performance such as teachers' teaching methods, inadequate instructional materials, students' readiness, students' test-anxiety, negative attitudes and difficulty in the subject contents. All these are responsible for low performance of students in Mathematics (Ajani & Olabode 2018). Meanwhile, if students perceive that "Mathematics is difficult" during their formative years, Mathematics anxiety will be triggered.

Anxiety is a term used for several conditions that cause tension, uneasiness, nervousness, fear, apprehension and worry during lesson. Mathematics anxiety refers to the feeling of apprehension, fear or nervousness that students experience when learning or performing mathematical tasks (Ashcraft, 2002). This anxiety can manifest physically, emotionally, and cognitively, affecting students' interest, confidence, motivation, and overall academic performance in mathematics. According to Puteh (2002) teachers, peers and parents are responsible for triggering anxiety among students of Mathematics. Geometry anxiety on the other hand is loosely regarded to as feelings of fear, avoidance and dread when dealing with any topic relating to geometry. It is also seen as a cognitive behaviour arising from self-doubt and self-depreciation.Anxiety in students strengthen their belief that they are not capable and lack the knowledge to engage in geometry and they will continue to lose confidence in their active participation skills in geometry irrespective of their gender differences.

The persistent poor performance of students in Mathematics has variously been blamed on teachers' use of ineffective instructional approaches and failure to assess the students through both observation and measurement. In order to achieve this, teachers should be able to develop pedagogical skills that will make learning more interesting and reduce student's level of anxiety towards mathematics.

Methodology is very vital in any teaching-learning situation and the method adopted by theteacher may promote or hinders learning (Nwafor, 2017). Mathematics being a science subject therefore demands the teacher using appropriate teaching methods that will give the students opportunity to be

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actively involved (Ehiwaro, Aghamie&Azagbaekwu 2018). The search for improved strategies for teaching and learning of Mathematics is therefore a continuous process. This is basically what triggered the need for this study, in order to find out if scaffolding learning strategy will reduce students' test-anxiety and enhance their academic performance in geometry.

Scaffolding is a learning process designed to promote a deeper level of learning. Hartman (2002) identified a number of important scaffolds like giving approval, probing learner's ideas, structuring task activities and providing general hints or specific suggestions that will help the learner throughout the task. Asking learner questions and using appropriate written materials are other important scaffolding tools. Scaffolding strategy encourages dialogue between teacher and students which will provide the students with enough guidance and support to accomplish goals that are impossible without it. Apart from learning strategies used by teachers in teaching Mathematics, another factor of concern to the researcher is the issue of gender.

Gender has become a contemporary variable for Mathematics educators and researchers because of its effect on Mathematics teaching, learning, interest and performance (Adedeji, 2007). The issue of gender is significant in geometry performance. Meanwhile, gender is a biological distinction as well as a social label by which two groups are distinguished as males and females. The relationship between gender and the academic performance of students has been discussed for decades (Elitle, 2005). Consequently, this study investigated the effect of scaffolding learning strategy on test-anxiety of students in Geometry among senior secondary school in Zaria Metropolis, Kaduna State, Nigeria.

Purpose of the study

The study has the following objectives:

1. determine the effect of scaffolding learning strategy on the level of test-anxiety of secondary school students in geometry.
2. examine the impact of scaffolding learning strategy on the level of test-anxiety of male and female students in geometry.

Research questions

This study was guided by the following research questions:

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1. What is the difference between the test-anxiety level of students taught geometry using scaffolding learning strategy and those taught using the conventional method?
2. What is the difference between thetest-anxiety level of male and female studentstaught geometry using scaffolding learning strategy?

Research Hypotheses

The following research hypotheses were tested at $P \leq 0.05$ level of significance:

Ho_1: There is no significant difference in the level of test-anxiety of secondary school students when taught geometry using scaffolding learning strategy and the conventional method.

Ho_2: There is no significant difference in the level of test-anxiety of male and female students when taught geometry using scaffolding 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 were drawn from the population of senior secondary class two (SSII) in Zaria metropolis, Kaduna State. The names of schools from the population were written on pieces of paper from the zone and were put in a hat folded and shuffled. Simple random sampling technique involving the draw-from the hat method was used. The experimental group was taught geometry using SLS while the control group was taught geometry using 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 urban and rural areas which were made up of both single and co-educational. The sample size for the study was 122 Senior Secondary School year two students comprises of 60 male and 62 female selected from the two schools using simple random sampling technique.

The instrument used for the study was Geometry Test-Anxiety (GTA) which was adapted from Ahmad (2016) with a reliability coefficient of 0.87. It consisted of a five-point Likert scale questionnaire designed based on some test anxiety variables as it affects the learning of geometry in mathematics in secondary schools. After each statement, the numeric values 5, 4, 3, 2 and 1 were assigned to the response category that best represent students' reactions to each statement. The categories were Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A) and Strongly

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Agree (SA). The face and content validity were ascertained by two lecturers from the department of educational foundation in which one specialized in test, measurement and evaluation and the other one from psychology. .The construct validity and reliability were determined by the researchers using Cronbach Alpha. The result of the estimate was 0.95 and this index is considered high and significant enough for this kind of study. Ibrahim, (2015) asserted that an instrument is considered reliable if its calculated values lies between 0 and 1, and the closer the calculated reliability coefficient is to zero, the less reliable is the instrument.Meanwhile, the closer the calculated reliability coefficient is to 1, the more reliable is the instrument. Since the reliability of this instrument is closer to one (1) than to zero, this indicated that the internal consistency of the instrument is within the acceptable level.

Results and Discussion

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

Research Question One:

What is the difference between the test-anxiety level of students taught geometry usingscaffolding learning strategy and those taught using the conventional method?In order to answer this question, mean rank and mean rank difference were calculated. Summary of the mean rank and mean rank difference of the students' test-anxiety level result was presented in Table 1.

Table 1: Mean Rank of the students Anxiety level in Geometry between the Experimental Group Two and Control Group after Exposure to Treatment.

Group	N	Mean Rank	Mean Rank Diff
Experimental	63	57.75	7.75
Control	59	65.50	

The result in Table 1 shows the mean rank and mean rank difference of the Students' Test-anxiety level in Experimental group and the control group. The experimental group had the lowest mean rank of (57.75) from the total number of students involved in the study while the control group had the highest mean rank score of (65.50). The mean rank difference between Scaffolding Learning Strategy (SLS) and the Conventional Method (CM) is 7.75.

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Null Hypothesis One

There is no significant difference in the level of test-anxiety of secondary school students taught geometry using scaffolding learning strategy and the conventional method. This was analysed using Mann-Whitney U-test for independent sample. This is because, when the dependent variable is either ordinal or continuous, but not normally distributed, Mann-Whitney U-test is often considered as the nonparametric alternative to independent t-test. The summary of the analysis was presented in Table 2:

Table 2:Mann Whitney U-test for Test-anxiety between the Experimental and the Control Groups

Group	N	Mean Rank	Sum of ranks	U-value	P-value	Remark
Experimental	63	57.84	3731.51	1453.51	0.01	Sig.
Control	59	70.11	4248.51			

Significant at $p \leq 0.05$

The result in Table 2 shows that the calculated U-value was 1453.51 with P-value 0.01. The P-value of 0.01 is less than alpha value of 0.05. Based on this result, the null hypothesis was rejected this implies that there is significant difference between the mean test-anxiety scores of the experimental group and their counterparts in the control group.

Research Question Two:

What is the difference between the test-anxiety level of male and female students taught geometry using scaffolding learning strategy? To determine the difference between male and female students exposed to Scaffolding Learning Strategy (SLS) in terms of their level of test-anxiety in geometry, the students' test-anxiety scores were calculated. Summary of the mean rank and mean rank difference of the students' test-anxiety level was presented in Table 3.

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Table 3: Mean Rank of the students Test-Anxiety level in Geometry between male and female in the Experimental Group after Exposure to Treatment

Group	N	Mean Rank	Mean Rank Diff
Male	33	30.55	3.05
Female	30	33.60	

The result in Table 3 shows the mean rank and mean rank difference of Students' test-anxiety level in geometry between male and female students in the Experimental group. The female students had the highest mean rank of (33.60) from the total number of students in the Experimental group while the male students had the lowest mean rank of (30.55). The mean rank difference between the male and female students is 3.05.

Null Hypothesis Two:

There is no significant difference in the level of test-anxiety of male and female students taught geometry using scaffolding learning strategy. Mann-Whitney U-test statistic was used to test this hypothesis at $\alpha \leq 0.05$ level of significant. The summary of the analysis is presented in Table 4.

Table 4:Mann WhitneyU-test for Test-Anxiety level between Male and Female students in the Experimental Group.

Group	N	Mean Rank	Sum of ranks	U-value	p-value	Remark
Male	33	30.55	1008.00	447.00	0.51	Not Sig.
Female	30	33.60	1008.00			

Not significant at $p > 0.05$

The result in Table 4 shows that the calculated U-value was 447.00 with P-value 0.51. The P-value of 0.51 is greater than alpha value of 0.05. Based on this result, the null hypothesis was retained, this implies that thereis no significant difference in the level of test-anxiety of male and female students taught geometry using scaffolding learning strategy.

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Discussion

The present study investigates the effect of Scaffolding Learning Strategy on Test-anxiety of students in Geometry among Senior Secondary Schoolin Zaria-Metropolis, Kaduna State, Nigeria.The result of the study on test-anxietyrevealed thatstudents who weretaught geometry using Scaffolding Learning Strategy (experimental group) exhibited significantly lower test-anxietylevels, resulting in improved academic performance. In contrast, their counterparts in the control group, who were taught geometry using theconventional method, demonstrated higher test-anxietylevels, which affected their academic performance in geometry. This implies that a low level of anxiety towards geometry can result to higher performance in the subject as confirmed in the major findings of the study supported by (Andrew & Wilson, 2004, Putwain, Woods & Symes, 2010).

More so, Chika and Ameh (2018) agrees with the present study that the low achieving Mathematics learners who received instruction in planning, monitoring, regulation/reflection and evaluation had a significant reduction in their level of test-anxiety than those in the control group. Moreso, the result agrees with the findings of Remalyn (2013), who observed that there was a significant difference in the level of test anxiety of students exposed to scaffolding strategy and those exposed to the conventional method.Meanwhile,the finding of Birgin (2010) in Abubakar (2021) disagree with the present study, the study discovered that there was no significant difference in the level of anxiety of students taught Mathematics using scaffolding strategy among grade sixth students in Turkey.Furthermore, Maksic and Smiljana (2021) noted that scaffolding creativity in the educational setting encompasses scaffolding of knowledge acquisition, personal perspectives, problem solving, imagination, interests and freedom of expression. Scaffolding occurs in communication with the students' teachers and peers through the usage of cultural tools. In similar way Luo, Wang and Luo (2009), investigated Mathematics anxiety in middle school students. Their findings agreewith the result of the present study, the researchers found out that the better the performance of a student in Mathematics, the less Mathematics anxiety the students may have, the worse a student'sperformance, the more Mathematics anxiety they may have. It was concluded that Mathematics anxiety usually happens among the low performance students.

The findings of the present work showed that there was no significant difference in the level of test-anxiety of male and female students taught geometry using Scaffolding Learning Strategy. This implies that Scaffolding Learning Strategy helps in the reduction of test-anxiety not minding the gender difference of the students. This finding is similar to the findings of Azih and Nwosu (2011)

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who reported that gender had no significant difference in the level of test-anxiety of male and female students when taught with scaffolding learning technique. More so, the finding confirmed the work of Ajai (2010) who stated that when a good teaching method that involves students' interaction within learning environment is used, there will be no gender difference in their performance, interest as well as their level of anxieties.

Conclusion

Based on the findings from the study, it has been able to establish thatScaffolding Learning Strategy enhanced students' performance in geometry more than the conventional method and reduced the level of students' test anxiety in geometry. It was concluded that Scaffolding learning strategy encourages sharing of ideas among students, fostered cordiality and friendliness in the classroom and this made the lesson interesting for the students. Both male and female students performed equally when taught with Scaffolding learning strategy. 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. Teachers should intensively employ the use of scaffolding learning strategy in teaching geometry and other aspects of Mathematics at all levels of both senior and junior secondary schools.
2. The curriculum planners should examine the effectiveness of scaffolding learning strategy (SLS), and consider its suitability for the teaching of geometry concepts to enable the principals and teachers of secondary schools to incorporate it into the school curriculum.
3. Ministry of education should organise workshops/seminars to train and re-training in-service teachers and create awareness on the use of scaffolding learning strategy.

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