EFFECTS OF THE PEER TUTORING APPROACH ON SENIOR SECONDARY SCHOOL MATHEMATICS STUDENTS'ACHIEVEMENT IN BIU LOCAL GOVERNMENT EDUCATIONAL ZONE, BORNO STATE, NIGERIA

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Mathematics at the basic and secondary school level is mostly hated by students because of its abstract nature and how it is presented resulted lead to much failure in WASSCE. The thrust of the study is to determine the effects of the peer tutoring approach on senior secondary school mathematics students' achievement in Biu Local Government Borno State. The design is pre-test post-test quasi-experimental research. The sample of 126 (SSSII) mathematics students was drawn from four randomly sampled secondary schools in Biu Local Government, Borno State. The study was guided by two research questions where the treatment for the experimental group was done by peer tutoring while the control group was taught by a conventional method. The instrument used for data collection was the Achievement Mathematics Test (AMT) which was subjected to both content and face validity with a reliability coefficient of 0.77 by Kuder Richardson (KR 20) method. Mean and Standard Deviation were used to answer the research question. The findings of the study provided the empirical basis to recommend that secondary school teachers should always peer tutoring in mathematics teaching.

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Introduction

Building mathematics interest in students is not as easy as it sounds, students need to know some basic facts on what mathematics is all about because the knowledge of mathematics is not only important and useful to the learner alone but for everyone who intends to play a part in the current change in our modern society, that is useful in astrological development of the human intellectual focus. Students perceive that mathematics is difficult so students lose confidence in the subject and this leads to poor performance in mathematics (Okoli & Egbunonu, 2012). Mathematics is one of the compulsory subjects offered at almost all levels of education.

The lecture method of teaching is one of the frequent methods used by teachers to impart knowledge in Nigeria and the world as a whole because lecture has the advantage of being less tasking, allowing for wider content coverage within a short time and can also be applied to a large number of students at a time. In the lecture method, the teacher is being more active in the learning process than the students. According to Albaar, Acim and Abdullah (2023), Students only listen to explanations from the teacher and tend not to be invited to understand the concepts of the material so students are slow in mastering and understanding the learning material which is why it does not always produce positive outcomes. However, mathematics learning in

schools today seems as if students only receive, listen, or record explanations given by the teacher and work on problems according to examples and direction from the teacher(Syahrial, Kurniawan, Asrial, Sabil, Maryani, and Rini, 2022). Efforts need to be made to increase students learning active involvement by applying an appropriate learning model so that the objectives of the learning and teaching can be achieved (Purnomo, 2021).

Peer tutoring approach on the other hand is a strategy which involves students assisting each other in learning content usually through structured interaction where one student within the group assumes the role of the tutor while others are tutees (learners). This method has gained attention for its potential academic and social benefits. Studies have demonstrated that peer tutoring can bolster performance, especially in mathematics and science. Beyond academics, peer tutoring fosters social interaction, communication skills and collaborative learning leading to a more inclusive classroom environment (Toppings and Duran, 2017). Effective peer tutoring requires proper training of tutors for productive interaction and accurate delivery of content. Therefore, positive learning outcomes are expected through adopting Peer Tutoring Strategy (PTS) which will integrate the nature of the subject with the theory, models, strength of knowledge and mode of tutoring (Imoko and Agwaga, 2006: Tyler, 2003).

There are many debates about gender differences in mathematics educational achievement. According to Astalini et al, 2023, males are intrinsically and genetically superior to females in cognitive ability which determines excellence, particularly in physical science. For instance, males are good at abstract thinking while females are good at correlating reasoning (Darmaji, Astalini, Kurniawan and Adila, 2022). In terms of social interaction males interact confidently because of being ridiculed by their peers towards working hard in school to achieve academic excellence while females are not like males because of social limitations like domestic chaos depression, societal norms and inferiority courses like mathematics is masculine in nature and this could be the reason while many females left the science for social science and art.

Problem Statement

It is a known fact that learners are continually receiving mathematics instructions but still, there are high failure rates of students in mathematics WASSCE. Hence the need to investigate the causes of the high failure rate in mathematics becomes necessary. Poor mathematics performance hinders many students from proceeding to further studies and such students eventually drop out. The predominant use of the didactic lecture method in school especially in science and mathematics teaching leads students to develop poor attitudes to the subject. This subsequently leads to poor performance in the subject. Mathematics is a core subject offered by all students at the basic and secondary school level (National Policy on Education, FRN, 2004). Despite the efforts of many researchers in proposing teaching methods to curtail the abysmal poor performance in mathematics (WASSCE) in Nigeria, students still fail the subject (Adamu and Yabo, 2024). The thrust of the study is therefore to determine the effect of peer tutoring approach on senior secondary school mathematics students' achievement in Biu Educational Zone Borno State.

Objective of the Study

The objective of the study is to determine the effect of peer tutoring strategy on senior secondary school mathematics students'

achievement in Biu in Local Government, Borno State. The specific objectives are to:

1. Determine student's achievement in senior secondary school when taught mathematics using peer tutoring strategy and conventional method
2. Determine the influence of gender on the achievement of senior secondary school students when taught mathematics using peer tutoring strategy and conventional methods.

Research Questions

1. What are the mean post-test scores of senior secondary school students' achievement in mathematics when taught using the peer tutoring approach and conventional method?
2. What is the gender difference in the mean achievement scores of senior secondary school students in mathematics when taught using the peer tutoring approach and conventional method?

Literature Review

The theoretical framework of the study is based on the social constructivist views of learning that emphasize the role of the students to generate learning where students coach peers through social interaction within their zone proximal development Vygotsky (1978). According to the theory, the range of tasks too difficult for the learner to do alone is possible with the help of adults and more skilled learners.

Peer tutoring involves dividing the entire class into groups of two - five students with different ability levels. Students then act as tutors, tutees or both tutors and tutees. Typically, peer tutoring involves highly structured procedures, direct rehearsal, competitive teams, and the posting of scores (Herper and Maheady 2007).

Abdulmalik and Ttortpev (2016) examine the impact of class-wide peer tutoring strategy on secondary school low learners performance in redox reaction in Funtua educational zone Katsina State, Nigeria. The study is a quasi-experimental research design involving a population of 977 SSII students. A sample of 108 slow learners from two secondary schools was used, guided by three hypotheses tested using a T-test at 0.05 level of significance. Treatment for the experimental group was by Class Wide Peer Tutoring (CWPT) and the control group was taught by conventional method. REdox Performance Test (REPT) duly validated by the expert with a reliability coefficient of 0.85 through the test re-test method. Results revealed that learners taught by peer tutors using CWPT performed significantly better than those taught by a conventional method. The study recommended that chemistry teachers should be trained through workshops, seminars and conferences on the use of class-wide peer tutoring strategy in teaching and learning chemistry. Abdulmalik and Ttortpev (2016) study is relevant to the present study because the study is on the same instructional strategy model of tutoring except on different subjects. The study is a quasi-experimental and also the research questions were analyzed using the Mean and Standard Deviation in the area of similarity. Akpan Sylvester, Okworo, Gibson and Emma (2017), study is relevant to the present study in the sense that the peer-assisted cooperative instructional strategy is a model of the peer tutoring approach. The area of relevance includes the use of quasi-experimental research design and Mean and Standard Deviation to answer the research questions while the area of difference includes the use of T-test to analyse the hypotheses which may not give a valid result because the T-test is not suitable for comparing control and experimental group while the present study used and standard deviation to answer the research questions.

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Abdulmalik and Ttorpev (2016) examined the impact of the Class-Wide Peer-Tutoring Strategy on secondary school slow learners' performance in redox reactions in Funtua Education Zone, Katsina State, Nigeria. The study is Quasi-experimental design involving a population of 977 SS2 Students. A sample of 108 slow learners from two secondary schools was used guided by three hypotheses tested using t-test at 0.05 levels of significance. Treatment for the experimental group was by class wide peer tutors (CWPT) and the control group was taught by conventional method. Redox Performance Test (REPT) duly validated by experts with a reliability coefficient of 0.85 through the test-retest method. Results revealed that learners taught by peer tutors using CWPT performed significantly better than those taught by a conventional method. The study recommended that chemistry teachers should be trained through workshops, seminars and conferences on the use of class-wide peer-tutoring strategy in teaching and learning chemistry. Abdulmalik and Ttorpev (2016) study is relevant to the present study because the study is on the same instructional strategy model of tutoring except on different subjects. The study is a quasi-experimental and also the research questions were analysed using mean and standard deviation in the area of similarities.

Akpan, Sylvester, Okworo, Gibson and Emma (2017), examined the effect of peer-assisted cooperative instructional strategy on the ability levels of students. Two research questions and hypotheses were developed to guide the study. A total of 110 Senior Secondary Chemistry students were used. Cognitive Ability Test (CAT) and Chemistry Performance Test (CPT) were the instruments used. Reliability coefficients of 0.82 and 0.80 were obtained for CAT and CPT respectively using Kuder-Richardson formula 21. Data collected were analyzed using mean, standard deviation, independent t-test and analysis of covariance. it was observed that peer-assisted cooperative strategy affected the cognitive ability levels of chemistry students.

Akpan, Sylvester, Okworo, Gibson and Ema (2017), study is relevant to the present study in the sense that the peer-assisted cooperative instructional strategy is a model of the peer tutoring approach. The area of relevance includes; the use of quasi-experimental design and mean and standard deviation to answer the research questions while the area of difference includes the use of t-test to analyse the hypotheses which may not give a valid result because t-test is not suitable for comparing control and experimental groups while the present study uses mean and standard deviation to answer the research questions.

The literature was reviewed from the work of other researchers. The review of the related literature covered many areas such as peer

tutoring strategies and conventional learning methods of teaching mathematics as well as issues of gender differences in mathematics achievements and uniqueness of the study.

Abdulmalik and Ttorpev (2016) study is relevant to the present study as well as that of Akpan, Sylvester, Okworo, Gibson and Ema (2017), are models of peer tutoring approach. I n conclusion, most of the empirical studies rev iewed contain some gaps filled by the present study. None of the reviewed studies was conducted in Borno State; while the present study was conducted in Biu local Government Educational Zone of Borno State.

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Methodology

The design of this study is quasi-experimental which involves a pre-test, post-test non-equivalent control group design as intact class was used as no sampling of subjects was made Sambo (2005).

Symbolically

Groups				
Experimental	1	01	X	02
Control	2	03		04

01 and 03 represent the pre-test scores while 02, 04 represent the post-test of all the groups, X is the treatment or the experimental group taught peer tutoring while the control was taught using the conventional method.

The target population for the study consists of 1,325 SS11 students with the sample of the study consisting of 126 (91 males and 35 females) students from four intact classes randomly selected in four senior secondary schools to participate in the study in Biu Local Government, educational zone, Borno State. (Borno State Ministry of Education Science Technology and Innovation, 2024).

The data for the study was collected with the Ability Grouping Test (AGT) which was a different but equivalent instrument to the (AMT) conducted to the experimental groups to classify the student's high and low-ability groups. The students' numbers were recorded before the experiment, while (AMT) was be used at the beginning of the experiment for the pre-test and post-test using two trained research assistants recruited by the researcher. The study was conducted in four weeks. Descriptive statistics was used to answer the research questions using SPSS version 22. The data was analysed using mean, and standard deviation.

The instrument was constructed from Senior secondary school two (SS11) mathematics syllabus of the West African Examinations Council (WAEC), 2022-2023. The AMT consist of 50 items drawn from four topics approximations, standard form, logarithms and trigonometry which was taught by four recruited research assistants and trained by the researcher. The instruments used for data collection include "Achievement Mathematics Test (AMT) and the Ability Grouping Test (AGT). The AMT consists of 50 item objective tests with one key and 3

distractors is also used for the Ability Grouping Test as it can serve both purposes.

The AMT containing 50 items was given to two experts who are Science Education, Test and Measurement experts from Gombe State University for the face and content validation

Group	N	$\bar{x}$	σ
Male	91	37.45	12.66
Female	35	37.17	11.70
Total	126	37.02	11.31

requested to assess the appropriateness of the items in terms of clarity of expression, answers accuracy suitability and content coverage. After the validation, six items were considered irrelevant and were removed remaining 44 items. The new observation made was that the four rejected items have wrong answers while two have complicated questions. The remaining 44 items were subjected to pilot study on 40 students (male and female) at Government Senior Science Secondary Sc hool Biu. Thus a reliability coefficient of 0.77 was found using Kuder Richardson 20 method (K-R20).

Results

Table 1: Descriptive Statistics of Students' Pre-test and Post-test Mean Difference for Experimental and Control Group

	Pre- test			Post-test		
Group	N	$\bar{x}$	σ	N	$\bar{x}$	σ
1	62	42.05	13.41	62	66.10	14.66
2	64	32.84	9.25	64	49.72	12.21
Total	126	37.37	12.35	126	57.78	15.74

N = Number of Students, $\bar{x}$ = Mean of the Scores, σ = Standard Deviation, Group 1 =Experimental Group, Group 2 = Control Group

Research question 1 was answered using mean and standard deviation in Table 1. The number of students who participated in the study is 126 with 62 students in the experimental group and 64 in the control group. The pre-test mean score of the students in the experimental group is 42.05 with a standard deviation of 13.41 while the pre-test mean score of students in the control group is 32.84 with a standard deviation of 12.35 favouring the experimental group. Also, the analysis of the post-test mean scores of students taught mathematics using the peer tutoring approach and lecture method showed the mean score of the students taught mathematics using peer tutoring approach is 66.10 with a standard deviation of 14.66 while that of the students taught mathematics by lecture method is 49.72 with a standard deviation of 12.21. The difference in the mean scores of the two groups is 16.38 favouring peer tutoring approach.

Answer to Research Question 2

Research question 2 was answered using descriptive statistics showing that 91 students are male with a mean score of 37.45 and a standard deviation of 12.66 while 35 students were female with a mean score of 37.17 and a standard deviation of 11.70. Based on the result the mean achievement score of male students is slightly higher than that of the female students when taught mathematics the difference in the

mean scores of the male and female students is 0.28 favouring male students.

Summary findings of the study

1. Students showed improvement in their performances when taught mathematics using Peer tutoring approach and lecture method as presented in Table 1, since the mean scores of the students on the post-test is significantly better than their mean scores at the pre-test according to the descriptive statistics. Students taught mathematics using the Peer tutoring approach performed better than those taught using the lecture method with Post-test scores of 42.05 and a standard deviation of 13.41 while the mean scores of mathematics students in the control group is 32.84 with a standard deviation of 12.35favouring the experimental group.
2. Students' achievement scores according to gender differ significantly as presented in Table 2, where the descriptive statistics showed that the mean achievement scores of 91 male students are slightly higher than the mean scores of the 35 female students when taught mathematics using peer tutoring and lecture method since the male has the mean of 37.45 with a standard deviation of 12.66 while females mean scores is 37.17 with a standard deviation of 11.70 favouring male students.

This result is in line with the findings of Abdulmalik, and Ttorpev, (2016) revealed that learners taught by peer tutors using Classwide Peer Tutoring (CWPT) performed significantly better than those taught by a conventional method. Akpan, Sylvester, Okworo, Gibson and Ema, (2017) observed that peer-assisted cooperative strategy affected cognitive ability levels of chemistry students. Also in terms of gender, the study corresponds to that of Astani et al., (2023) Males are intrinsically and genetically superior to females in cognitive abilities which determine excellence, particularly for physical sciences.

Conclusion

Based on the findings and the discussion of the study above, this conclusion was made. One of the major conclusions derived from this study is that the peer tutoring approach is better than the conventional method of teaching mathematics gender difference was also found to be sensitive in Biu LG, Biu of Borno State.

1. Mathematics teachers should be encouraged to learn how to the use peer tutoring approach in teaching since this method enhances achievement and has the potential of developing teamwork through interaction and to benefit from each other's experience.
2. The government should increase resources to carry the peer tutoring approach successfully as the approach requires enough papers, worksheets and flashcards among other stationaries.

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