

Effect of Peer Tutoring on Senior Secondary School Students' Academic Performance in Mathematics in Ahoada East Local Government Area of Rivers State

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Abstract

This work investigated effect of peer-tutoring on senior secondary school students' academic performance in mathematics in Ahoada East Local Government Area of Rivers State. The study adopted quasi experimental research design of pre-test, post-test non-equivalent group design. This was premised on the fact that; there has been poor performance of students in both internal and external examinations among the senior secondary school students in Mathematics in the schools. Two research questions and two hypotheses were formulated to guide the study. A sample size of one hundred and ninety- five (195) students was drawn from a population of four thousand, one hundred and fifty-eight (4,158) SS 2 students. Mathematics performance test (MPT) and lesson notes (LN) were the two instruments used for data collection. The face and content validities of the instrument was done by three experts in Educational Measurement and Evaluation in the Department of Guidance and Counselling, Ignatius Ajuru University of Education. A reliability coefficient of 0.76 was obtained for the MAT using test-re-test reliability method. The data collected were analysed using mean, standard deviation and ANCOVA which were tested at 0.05 level of significance. The result of the findings revealed that students taught Mathematics using Peer Tutoring Strategy performed better than those taught using Conventional Teaching Method. It is therefore recommended that peer tutoring strategy be incorporated in the teaching of other subjects.

Keywords: Peer Tutoring, Peer Tutor, Tutee, Conventional Teaching Method, Academic Performance.

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INTRODUCTION

The importance of Mathematics in everyday life cannot be over emphasized. It is the language and tool that is used in almost every field of science. It helps in recognition of patterns and understanding the world. However, many students find it difficult to understand and perceive it as a very difficult, abstract and challenging subject. This may be due to the common approaches adopted by most classroom teachers in the subject which is the lecture method where the teachers starts the lesson with introduction of the topic, explaining the basic approaches to solving the some problems and giving the students assignments to work in class and at home. This method has consistently proved to be not too helpful to students in their understanding of mathematics hence the consistent poor results in mathematics in external and internal

examinations by students both at the BECE and SSCE levels and the need to try other methods of teaching the subject.

One method of teaching that engages students in active learning is the peer tutoring method. Others include group, discussion method and mentoring. In using the peer tutoring method, students are allowed to teach themselves in an organized setting where one student acts as the tutor and others as the tutees. The more intelligent students are asked to act as the tutors while the less intelligent ones learn as the tutees. Through interactions among themselves, both sets of students can learn from each other by playing, talking and sharing ideas and sometimes even through quarreling. Peer tutoring is defined as a system of instruction during which students help one another comprehend the material and in turn learn by teaching

(Goodlad & Hurst in Wolfe, 2018). The term peer tutor refers to an individual with the same status as the individual being tutored, which in most cases is not the teacher. Its first use was recorded in the late 1970's in England. Andrew Bell, a superintendent of a military male asylum, began using it to better educate his male students and to save money for his school whose budget faced serious problems. Since then, it has been adopted and used for different purposes throughout the world (Wolfe, 2018). At present, the significance of peer tutoring is increasing, and it has become an important part of diverse courses and different disciplines in many countries, (Ali *et al.*, 2015).

Peer tutoring has been proven to have a lot of positive impacts on students' learning, motivation and socialization, Eisenkopf in Ullah, Tabassum and Kaleem (2018). The peer tutors gain more insight into the content as they have to read and prepare for the lessons and the tutees also gain from the lesson as they feel free to interact with their peers to learn. Scruggs, Mastropieri, and Marshak (2012) noted that peer tutoring is that tutorial strategy where students are trained on how to partner with their peers in order to improve their overall knowledge. They learn to use tutoring materials, alternate as the tutor and the tutee, ask appropriate questions, and deliver feedback in a very positive manner. Nawaz and Reman (2017) saw peer-tutoring as a strategy of teaching whereby the class is organized in pairs of two students that may be of varied abilities to serve as tutor and tutee in the learning process in order to get maximum benefits from each other. Peer tutoring can also be seen as a system of instruction during which students help one another comprehend the material and in turn learn by teaching (Goodlad & Hurst in Wolfe, 2018).

Ullah, Tabassum and Kaleem (2018) carried out an experimental study on the effect of peer tutoring on students' academic achievement in Biology. They used a Posttest-Only Equivalent Group Design was used. Their sample consisted of 40 students in the Allied National Software Institute (ANSI), Mardan, Khyber Pakhtunkhwa. Independent sample t-test was used for data analysis. Results showed that the mean score of the experimental group was significantly better than that of the control group.

Mirzoeglu (2014), conducted a study aimed at finding out the effect of peer tutoring on the achievement in cognitive, psychomotor domains and game performance in volleyball courses of university students (males and females). This finding showed that using different instructional models improves students' achievement in cognitive, psychomotor domains and game performance. Hulya in Re'ad *et al.*, (2016) also carried out an experiment to determine the effectiveness of one of the interactive engagement method which is peer instruction enriched by concept test on students'

achievement and attitude towards physics. The results showed that peer tutoring method which makes all students feel part of the learning process, has a significant effect on the academic performance of students than those exposed to conventional method.

Ezenwosu and Nworgu, L.N (2013) investigated the efficacy of peer tutoring and gender on students' achievement in Biology. International Journal of Scientific & Engineering Research, in Aguata Education zone of Anambra state, Nigeria. Two research questions and three hypotheses guided the study. The study adopted pre-test –post-test non-equivalent control group quasi-experimental research design. The population of the study comprised 1731 SS11 students and a sample size of 228 students from two co-educational secondary schools in the zone. Biology Achievement Test (BAT) was used to collect data. Mean and standard deviation was used to analyze the research questions while the hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). The results among others showed that students taught biology using peer tutoring performed significantly higher in BAT than those taught biology using the conventional lecture method. The result further revealed that male students slightly performed better than female students.

Uyim, and Nonye (2019) investigated the Effect of Peer tutoring on achievement of Students in Business Studies in public junior secondary schools in Gassol Education Zone of Taraba State. Pre-test, post-test, control group, non-randomized quasi-experimental design was employed. The population of the study was made up of all Junior Secondary Two Students in the fifteen public secondary schools in the study area. One hundred and sixty -seven (167) JS 2 students were randomly sampled from four out of the fifteen schools in the zone and used for the study. Two schools were assigned to the control group and the other two schools were assigned to the treatment group. Two instructional packages were developed for the control group and the treatment groups. Data on students' achievements in Business studies was collected using Business Studies Achievement Test (BUSAT). The data were analysed using mean and standard deviation while the hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance. The results showed that the relative efficacy of peer tutoring was consistent across gender groups. Students' achievement was improved however, there was no significant difference in based on gender and no interaction effect of methods and gender on students' achievement in Business Studies.

Vassay (2010) conducted a study to find out the effect of peer tutoring strategy on the mathematics performance of students in two phases. Phase 1 examined the effects of peer tutoring in developing the foundation of students in numbers, integers, decimals,

and fractions, while phase 2 measured the performance of students in college algebra. Pre-test post-test control-experimental group design was used in the study and data obtained was analysed using t-test. The results indicated that the experimental group performed better than the control group. Bryan in Peter (2017) also investigated the effects of peer tutoring on the academic achievement of university students in Georgia, when he discovered that those exposed to peer tutoring performed better than those that are not exposed to peer tutoring.

The conventional teaching method which usually involves the teacher starting the lesson by introducing the topic, explaining it, give some worked examples and finally gives homework to the students have not been learner centred. In this kind of learning environment, students find it difficult to construct their own comprehension since they are not completely taking part in the process of teaching and learning. They are also not able to think innovatively, creatively, and critically since they perceivably received what have been taught to them.

Some students find it difficult to keep up with the tempo of teaching in regular classrooms due to some individual differences. Nebo (2012) states that, the conventional method of teaching has failed to acknowledge the uniqueness of the inquiry based nature of mathematics and the learner's individuality thus failed to encourage creative and critical thinking in the learner, leading to poor achievement of students. Based on this, educators and scholars are challenged to seek for an intervention method that would enhance academic performance of students in mathematics. Some of these methods include; concept mapping, discovering method, co-operative learning, target task approach, peer tutoring etc. (Okoye, 2013). Hence, in order to promote active participation of students, teachers need to adjust their teaching approaches to a more learner-centred one and one possible approach of teaching is the peer-tutoring strategy which are systematic, peer-mediated teaching strategies (Miller, in Francisco *et al.*, 2018). Vasay in Ra'ed (2016) also finds that students' learning is influenced by the way they learn, with several of them learning best through active, cooperative, small-group work within and outside the classroom environment. This definitely contributes towards the development of students' generic skills of team-work, time-management, organizational and presentation skills and communication of mathematics.

Recent trends and observations in mathematics performance of students in internal examinations among senior secondary schools in Ahoada East Local Government Area of Rivers State indicate that, there is a poor performance by students in the subject. This low level in mathematics performance by students which is

also conspicuous at every level of the educational system has given mathematics educators a high level of concern. A lot of research efforts have been focused on identifying factors that constrains the learning of mathematics. (Anselm 2010) posits that poor motivation and lecture method have been highlighted as some of the problems. The approach used by many mathematics teachers is one which does not give room for students to develop their intuition, imagination, critical thinking and creative abilities. As a result of this, educators of mathematics are constantly interested on how and when to optimally adopt varied mathematics instructional techniques in order to attain the stated mathematics educational objectives. Much of the research done on the efficacy of peer tutoring in the teaching of mathematics have been foreign based and not much in Rivers State of Nigeria from existing literature. Hence, this study seeks to investigate the effect of peer tutoring instructional strategy on the students' academic performance in mathematics among senior secondary school students in Ahoada East Local Government Area of Rivers State, Nigeria.

Theoretical Review

The concept of peer tutoring has basis on the social learning theory by Vygotsky. According to Vygotsky's social learning theory, social interaction plays a major role in learning. He postulated that learning starts first from imitating others and then personalizing what has been learnt by applying it in specific situations where necessary. Also that there is the presence of zone of proximal development (ZPD) in every human being. This is a limit to what one can learn alone on his/ her own. After that, everyone needs significant others to develop his/her knowledge and skill further. At this stage in the learning process, peer tutoring can be of immense help to both the peer tutor and the tutee.

Research Questions

The following research questions were stated to guide the findings of the study:

1. Is there any difference in the mean scores of students in pre-test and post-test of those taught with peer tutoring and those taught with conventional teaching method?
2. Is there any difference in the mean scores of students in pre-test and post-test of male and female students in the peer tutoring and conventional method groups?

Research Hypotheses

Two hypotheses were also stated and tested by at 0.05 significance level.

1. There is no significant difference in the mean scores of students in pre-test and post-test of students taught Mathematics using peer tutoring and those taught using conventional teaching method.

- There is no significant interaction effect of gender and teaching method in the pre-test and post-test mean scores of male and female students in the peer tutoring and conventional method groups.

METHODS

The study was a quasi-experimental research that employed a pre-test post-test non-equivalent control group design. The population of this study was made up of all senior secondary school two students in all the 15 public senior secondary schools in Ahoada East Local Government Area with a total of 4158 students. However, for the purpose of this study, two public senior secondary schools were used. The experimental group (peer tutoring) was an intact class made up of fifty (50) males and fifty (50) females SSII students in school A. The control group (conventional method) was also an intact class made up of fifty (50) males and forty-five (45) females in school B, making a total of 195 students (100 males and 95 females). The instrument used for data collection was the Mathematics Performance Test (MPT) and lesson note (LN). This study used test-re-test statistical method to measure the reliability of the MPT. The MPT was administered twice to 30 Senior Secondary 2 students in a school different from the schools used in this study after which the reliability 0.76 was obtained using Pearson's Product Moment Correlation (PPMC)

coefficient. The experiment was carried out within a period of four weeks within which the experimental group was taught Mathematics using peer tutoring method under the supervision of the experimenter. The student tutors were given topics to prepare their own notes and teach their class after which the class had interaction with the tutors. Class works and assignments were also given to the students to practice, at the end of the four weeks, the MPT was administered to collect data for analysis.

The same topics were taught to the control group by the regular Mathematics teachers to the control group using the Conventional teaching method (lecture method) for four weeks and the MPT also administered and data collected. Mean and standard deviation was used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses formulated at 0.05 significance level. The data were analysed using Statistical Package for Social Sciences (SPSS), version 23.

RESULTS

Research Question 1: Is there any difference in the mean scores of students in pre-test and post-test of those taught with peer tutoring and those taught with conventional teaching method?

Table 1: Mean and Standard Deviation of Students' Mathematics Performance in Peer Tutoring and Conventional Method groups

Group	N	Pretest		Posttest		Mean Difference
		Mean	SD	Mean	SD	
Peer Tutoring	100	13.37	6.70	60.32	11.35	46.95
Conventional Method	95	13.03	5.33	40.33	9.42	27.30

The results in Table 1 indicate that the pre-test mean score of students taught mathematics using peer tutoring strategy was 13.37 (SD = 6.70), while their post-test mean score was 60.32 (SD = 11.35), showing a mean difference of 46.95. In the control group were the students were taught using conventional teaching method, their pre-test mean score was 13.03 (SD = 5.33) and a post-test mean score was 40.33 (SD = 9.42)

indicating a mean difference of 27.30. This shows that students exposed to peer tutoring performed better than those exposed to the conventional method.

Research Question 2: Is there any difference in the mean scores of students in pre-test and post-test of male and female students in the peer tutoring and conventional method groups?

Table 2: Mean and Standard Deviation of Male and Female Students' Mathematics Performance in Peer Tutoring and Conventional Method

Group	Peer Tutoring		Conventional Method	
	Male	Female	Male	Female
N	50	50	50	45
Pre-test Mean (SD)	15.40 (7.23)	11.34 (5.47)	14.00 (5.54)	11.95 (4.91)
Post-test Mean(SD)	61.76 (12.18)	58.88 (10.37)	43.92 (6.94)	36.35 (10.25)
Mean Difference	46.36	47.54	29.92	24.40

Table 2 show that the mean difference of male students exposed to peer tutoring was 46.36 while their female counterparts had a mean difference of 47.54. Also, the mean difference of male students exposed to

conventional method was 29.92 while their female counterparts obtained a mean difference of 24.40. These results showed that in the peer tutoring group, the female students had a higher mean difference than their

male counterparts while in the conventional method group, the male students had higher mean difference than their female counterparts.

H01: There is no significant difference in mean scores of students in pre-test and post-test of those in peer tutoring and conventional groups.

Table 3: Summary of ANCOVA on the Mathematics Performance of Students in Pre-test and Post-test of those in Peer Tutoring and Conventional Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	19850.115 ^a	2	9925.057	92.009	.000
Intercept	75264.586	1	75264.586	697.727	.000
Pre-test	395.742	1	395.742	3.669	.057
Teaching method	19284.173	1	19284.173	178.771	.000
Error	20711.239	192	107.871		
Total	539528.000	195			
Corrected Total	40561.354	194			

a. R Squared = .489 (Adjusted R Squared = .484)

The ANCOVA result in table 3 show that there is a significant difference in the mathematics performance of students in the pre-test and post-test of those in peer tutoring and conventional method, $F(1, 192) = 178.771, p < 0.001$. Therefore, the hypothesis was rejected. This implies that there is significant difference in the mean scores of students in pre-test and post-test

of those in the peer tutoring and conventional teaching method groups.

H02: There is no significant interaction effect of gender and teaching method in the pre-test and post-test mean scores of male and female students in the peer tutoring and conventional method groups.

Table 4: Summary of ANCOVA on the Mathematics Performance of Male and Female Students in Pre-test and Post-test of those in Peer Tutoring and Conventional Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	21174.338 ^a	4	5293.585	51.879	.000
Intercept	73941.166	1	73941.166	724.651	.000
pre-test	157.375	1	157.375	1.542	.216
Teaching method	19674.669	1	19674.669	192.819	.000
Gender	1027.627	1	1027.627	10.071	.002
teaching method * gender	301.261	1	301.261	2.952	.087
Error	19387.016	190	102.037		
Total	539528.000	195			
Corrected Total	40561.354	194			

a. R Squared = .522 (Adjusted R Squared = .512)

The results of the ANCOVA analysis as shown in table 4 show: $F(1, 190) = 2.952, p > 0.05$ for the interaction effect between gender and teaching method. This indicate that there is no significant interaction effect of gender and teaching method in the performance of male and female students in pre-test and post-test of those in peer tutoring and those in conventional method groups. Therefore, the null hypothesis is accepted.

- There was a significant mean difference in the mathematics performance of students in the pre-test and post-test of between those in the peer tutoring and those in conventional teaching method groups.
- There was no significant interaction effect of gender and teaching method in the performance of male and female students in the pre-test and post-test of those in the peer tutoring and those in conventional teaching method groups.

Summary of Findings

- Students taught Mathematics using peer tutoring strategy performed better than those taught with conventional method.
- In the experimental group, the female students had a higher mean difference than their male counterparts having been exposed to peer tutoring, while in the control group, the male students had a higher mean difference than their female counterparts when being taught with conventional method.

DISCUSSIONS OF THE FINDINGS

The results of this study indicated that when students are taught mathematics using an interactive method by their own peers, they perform better than when they are taught using the conventional method. This finding is in agreement with those of Vassay (2010), Bryan in Peter (2017), and Ullah *et al.*, (2018) who conducted similar studies and found that peer tutoring strategies improved students’ academic performance compared to the conventional methods of teaching.

The findings also showed that peer tutoring method makes for improvement in students' academic performance in mathematics in both male and female students though the females in this study performed better than their male counterparts in the post-test, however, the test for interaction effect did not show any significant difference. This finding is in agreement with that of Hulya in Re'ad *et al.*, (2016) and Uyim and Nonye (2019) who also observed that peer tutoring which makes all students feel part of the learning process, has a significant effect on the academic performance of students than those exposed to conventional method.

CONCLUSION/ RECOMMENDATION

Observations gathered during the exposure of students to peer tutoring suggest that the effective use and implementation of peer tutoring strategy in senior secondary schools in Ahoada East Local Government Area of Rivers State can significantly enhance and improve the social interaction and academic performance of students in mathematics. Peer tutoring offers the opportunity for students to learn from their peers, open up to ask questions and make both the tutor and the tutees to become aware of their strengths and weaknesses. Hence, if this method is used widely, it can help to make students to begin to like mathematics subjects, improve their performance and help in the implementation of the curriculum in mathematics. Based on these findings the researchers recommend that:

1. Since peer tutoring was discovered to be more effective than the conventional method in mathematics as shown in this study and others, the teaching strategy should be incorporated in teaching mathematics in regular classes and other subjects as well.
2. Teachers should from time to time give students topics to go and make inquiry about, so that before they teach a new concept, the students will be able to explain in their own terms what they have discovered about the new concepts.
3. Teachers who monitor peer tutoring sessions should also provide a form of reward system to reinforce and motivate students on task behaviour and participation.

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