HEIGHTEN TEACHING AND LEARNING OF MATHEMATICS THROUGH PEER TUTORING
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Abstract
Findings revealed that the teaching methods adopted in most secondary schools is teacher centred which is one of the factors that contributes to below average performance of students and for improved performance in students' academic performance there is need to shift the teaching strategy from teachers centred to students centred. Therefore, this study found how to improve teaching and learning of Mathematics in secondary schools through Peer Tutoring which is one of the student's centred methods. Four hypotheses were set at p≤ 0.05 level of significance. 2X2 factorial design in quasi-experimental research was used. One experimental group and one control group was used for the study. Simple random sampling technique was used to select two local government areas within Oyo town and one school from each of the two LGA. One intact class each was used from the two schools. Analysis of Covariance (ANCOVA) and T-test were used for data analysis. The result revealed that the mean achievement scores of students taught with peer tutoring was 17.56 and 8.19 for those taught with Conventional teaching method. The mean gain in achievement scores of students taught with Peer tutoring was higher than that for Conventional teaching method. There was a statistically significant difference in the mean achievement scores of students exposed to Peer Tutoring and Conventional Teaching methods and male students with mean score 14.63 performed better than the female students with mean of 11.63. There is interaction effect of the two instructional techniques on academic achievement of students. It was concluded that peer tutoring is an effective learning/teaching strategy. For students to be actively involved and perform better it was recommended that Mathematics teachers should combine peer tutoring with conventional teaching method.
Key Words: Peer, Tutoring, Mathematics, Achievement, Strategy, schools

Introduction
General under performance of students in mathematics cannot be allowed to go unattended to in secondary schools, been one of the compulsory subjects in secondary schools which is useful in our day-day activities. Several factors for student's underachievement in mathematics had been identified by different researchers among who are Suan (2014) the first was teacher factor, such as teaching styles, mastery of the subject matter, instructional techniques and strategies, classroom management, communication skills, and personality. Second was student factor like study habits, time management, attitude, and interests towards mathematics. Third was environmental factor such as parents' values attitudes, classroom settings and peer group. Also, Tshabalala and Ncuba (2013), findings revealed

that student's performance in mathematics was mainly affected by teaching methods, material resources, teacher behaviour, grounding in the subject at lower levels as well as their fear of the subject. Clement (2013) had associated student's failure in mathematics with teachers' teaching practices, that is what teachers do in the classroom, how teachers apply instructional methods and traditional ways of teaching. Such as lecture style teaching, teacher centre methods and rote memorization in teaching mathematics. Ali and Awatif (2014), and Oviawe Ezeji and Uwameiye (2015) established that peer tutoring is more effective than the teacher-centred method of instruction which is the common method of teaching in schools. Adedeji (2013) in his study ascertained that peer tutoring instructional techniques helped pupils to gain more knowledge irrespective of pupil's ability and gender.

Ezenwosu and Nworgu (2013) submitted that male students performed better than their female counterparts most especially in mathematics and the difference in their performance was significant. Oviawe and Uwameiye. (2015) reported that there is no significant interaction effect of gender and teaching methods on students' performance. Research have shown that most of the graduate, when they get to labour market, they are not able to defend their certificate because they read only to pass, and methods of teaching adopted in most of our institution seems not to encourage mastery. According to Adedeji (2013), mathematical demands on students increases as they progress through school to take up their adult lives at home and in the workplace.

To improve on student's academic performance, teachers must manage knowledge through innovation, dissemination and utilization of effective teaching and learning techniques that will be of help to students to reduce mass failures. To find solutions to problems of student's poor learning outcomes in schools and to actively involved students in teaching and learning process, active participation and involvement of students is required. Therefore, this study is interested in how to heighten teaching and learning of Mathematics through peer tutoring which is an instructional strategy that consists of student partnerships that link high achieving students with other students in the class during mathematics study sessions.

It is noted as a method that aids retention, raises students` self-esteem, allows for higher rates of student response and feedback, creates more opportunities for students to practice specific skills, helps student tutor gains a deeper understanding of a topic by teaching it to another student, it often helps students build relationships, encourages social interaction, allows students to show positive attitudes toward learning, develop their self-confidence and it is a method that results into better academic achievement for all levels of students in all subject area.

Peer tutoring is a teaching and learning strategy wherein students are paired with their classmates to practice academic skills and master content. Teachers may use peer tutoring to help accommodate a classroom full of diverse students who need more individualized attention in finding solutions to problems of student's poor learning outcomes in schools and to actively involved students in teaching and learning process. Under this strategy, active participation and involvement is required, it is noted that it is a method that aids

retention, raises students' self-esteem, and helps students to become lifelong learners and a teaching method that promotes higher achievements for all grade levels in all subject area.

To function effectively in live, students must have a strong foundation in mathematics. A strong foundation involves much more than the rote application of procedural knowledge, hence there is need to seek ways of improving teaching and learning processes in our schools. Various methods of teaching are employed to teach in our schools to ensure effective teaching and learning on the part of teachers and students respectively, but the failure rate has not reduced. On this note, there is need to find means of reducing the failure rate and ensure proper understanding of the subject matter on the part of the students.

Hypotheses: The following hypotheses were posed

H_{O1}: There is no significant difference in the mean achievement scores of students exposed to peer tutoring teaching strategy and those exposed to conventional teaching method.

H_{O2}: There is no significant difference in the mean gain in achievement scores of students exposed to peer tutoring teaching strategy and those exposed to conventional teaching method.

H_{O3}: There is no significant difference in the mean achievement scores of male and female students exposed to peer tutoring teaching strategy and those exposed to conventional teaching method.

H_{O4}: There is no significant difference in the interaction effect of academic achievement of students taught with conventional method and peer tutoring.

Method

This study is experimental research which utilised a 2X2 factorial quasi-experimental research design that involved one experimental group and one control group. The study used a pre-test post-test where students in the experimental group were taught all the first term topics recommended in the curriculum using peer tutoring teaching strategy while students in the control group were taught the same topics using the conventional teaching method. All secondary school in Oyo were considered as the population. Simple random sampling technique was used to select two Local Government Area (LGA) in Oyo town, one private schools from each of the LGA selected and 32 Senior Secondary two students from the two private secondary schools. Mathematics Achievement test which contains 40 multiple choice items selected out of the ninety (90) questions constructed originally after determining the difficulty, discriminating power and effectiveness of distractors, was given to teachers of mathematics for content and face validity constructed by the researcher was used for data collection. The students were to identify the key (the correct option) from options A-E. The highest obtainable score is 40 and was validated with twenty senior secondary school two students from another private school within Oyo town. The reliability index obtained was 0.82 using Kuder Richardson (KR-21) method. The data collected were analysed using T-test and Analysis of Covariance (ANCOVA) with the respective pre-test

scores used as covariates. The researcher with the help of two research assistance were involved in the data collection exercise over three months.

Results

The results obtained from the study are as shown in the following tables:

H_{O1}: There is no significant difference in the mean achievement scores of students exposed to peer tutoring teaching strategy and those exposed to conventional teaching method.

Table 1   Group Statistics

	Grouping variables	N	Mean	Std. Deviation	Std. Error Mean
Post test score	Experimental	16	17.5625	6.30311	1.57578
	Control	16	8.1875	6.64549	1.66137

Table 1 revealed that students in the experimental group with mean score of 17.56 performed better than students exposed to conventional method with mean score of 8.18.

H_{O2}: There is no significant difference in the mean gain in achievement scores of students exposed to peer tutoring teaching strategy and those exposed to conventional teaching method.

Table 2   Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post test score	Equal variances assumed	.278	.602	4.094	30	.000	9.37500	2.28981	4.69858	14.05142
	Equal variances			4.094	29.916	.000	9.37500	2.28981	4.69804	14.05196

not
assumed

In Table 2 the lower and upper confidence limit shows that we are 95% confident that the mean difference for the population which is 9.37500 falls between 17.5625 and 8.1875. Also, the 95% confidence interval for the estimated population mean difference is 9.34 which falls between 4.70 and 14.05 Since Levene's p>.05, then there is equality of variance therefore f=4.094, df=30, p=.000

An independent t-test showed that the difference between the experimental and the control group was significant (t=4.094, df=30. P=.000)
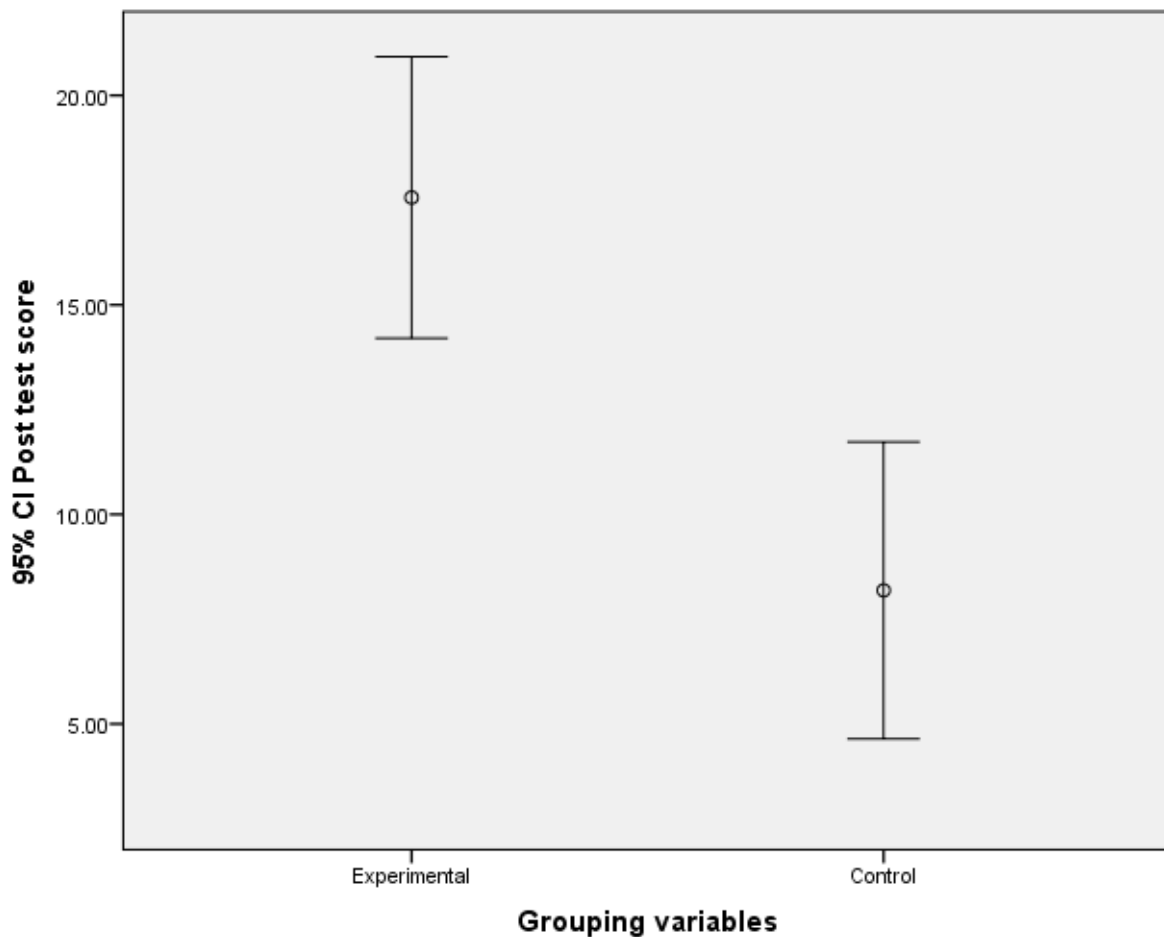
We reject the null hypothesis

Fig 1: Error Bar Chart

The Error Bar Chart in Figure 1 clearly revealed that there is no overlap between the scores of students in the experimental group and students in the control group.

Table 3   Between-Subjects Factors

		Value Label	N
Grouping variables	1.00	Experimental	16
	2.00	Control	16

Levene's Test of Equality of Error vari

Table 4   Dependent Variable: Post test

F	df1	df2	Sig.
12.120	1	30	.002

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + PreteSc + Group

Table 4 shows a significant level less than 0.05. therefore, the assumption of equality of error variance is violated.

H_{O3}: There is no significant difference in the mean achievement scores of male and female students exposed to peer tutoring teaching strategy and those exposed to conventional teaching method.

Table 5   **Group Statistics**

	Student gender	N	Mean	Std. Deviation	Std. Error Mean
Post test score	Male	16	14.6250	8.01561	2.00390
	Female	16	11.1250	7.74489	1.93622

Table 5 revealed that male students with mean score 14.63 performed better than female students with mean score 11.13. Therefore, the hypothesis is upheld since the difference is not significant.

Table 6   Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
									Lower	Upper	
Post test score	Equal variances assumed	.111	.741	1.256	30	.219	3.50000	2.78650	-2.19079	9.19079	
	Equal variances not assumed			1.256	29.965	.219	3.50000	2.78650	-2.19107	9.19107	

Table 6 revealed that the lower and upper confidence limit shows that we are 95% confident that the mean difference for the population which is 3.5 falls between 11.13 and 14.63. Also, the 95% confidence interval for the estimated population mean difference is between -2.19079 and 9.19079 Since Levene's p>.05, then there is equality of variance therefore f= 1.256, df=30, p=.110

An independent t-test showed that the difference between the male and the female students scores was not significant (t=1.256, df=30. P=.110 one tailed). We do not reject the hypothesis.

The sample mean for male is 14,63 and for female is 11.63.
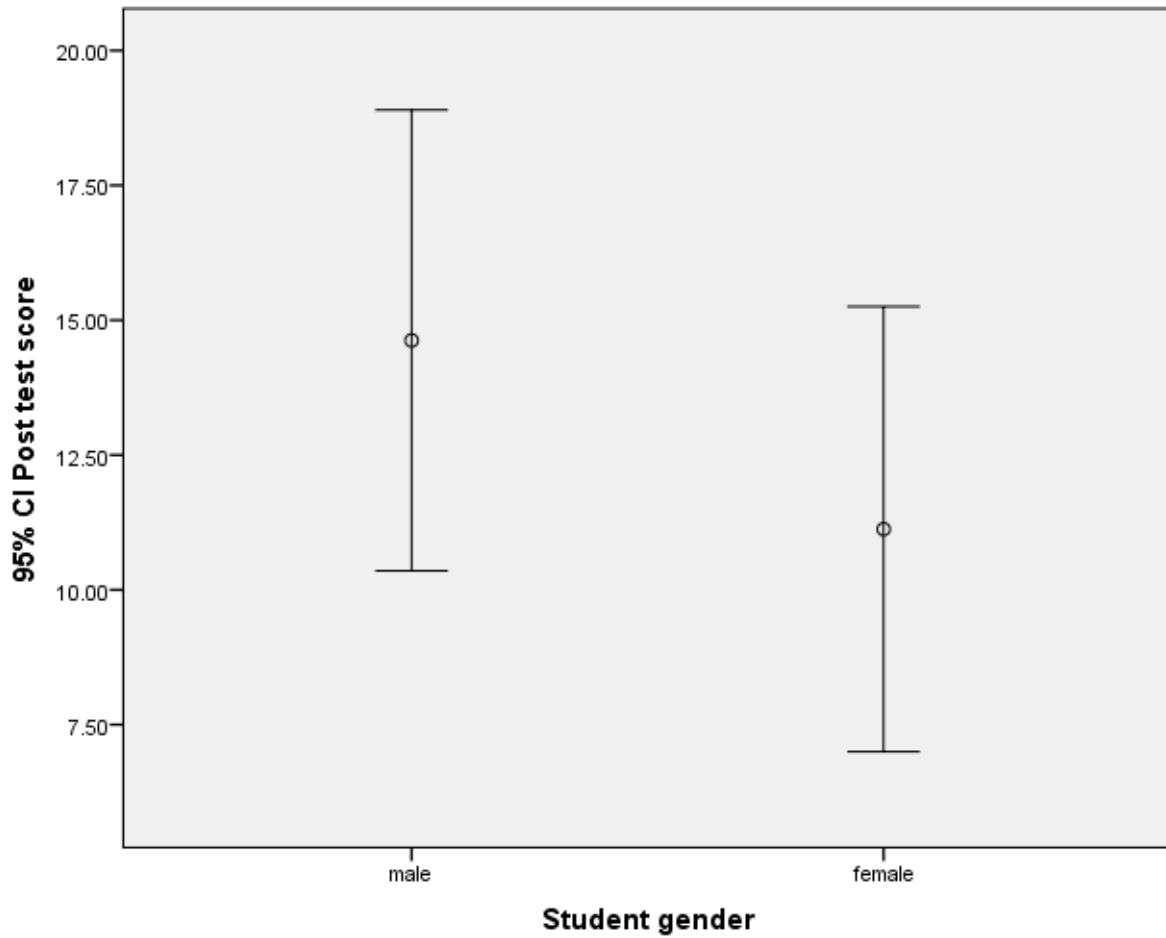
Figure 2: Error Bar
The in Figure 2 revealed that there is overlap between the two bars the male and the females post test scores.

H_{O4}: There is no significant difference in the interaction effect of academic achievement of students taught with conventional method and peer tutoring.

Table 7   Tests of Between-Subjects Effects

Dependent Variable: Post test score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1877.940[a]	2	938.970	325.874	.000	.957
Intercept	52.825	1	52.825	18.333	.000	.387
PreteSc	1174.815	1	1174.815	407.726	.000	.934
Group	113.764	1	113.764	39.482	.000	.577
Error	83.560	29	2.881			
Total	7266.000	32				
Corrected Total	1961.500	31				
a. R Squared = .957 (Adjusted R Squared = .954)						

Table 7 shows that the covariate is significantly related to the independent variable.

Table 8   Estimated Marginal Means

Grouping variables

Dependent Variable: Post test score

Grouping variables	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	14.931[a]	.444	14.023	15.839
Control	10.819[a]	.444	9.911	11.727
a. Covariates appearing in the model are evaluated at the following values: Pretest score = 5.0313.				

After adjusting for the pre-test score, there was a significant effect of the between subject factor group, $F(1,29)= 39.48$, $p<.005$, partial eta squared =.58. Adjusted mean suggests that using peer tutoring strategy will aid effective teaching and learning of mathematics in schools.

Discussion

P-value greater than 0.05 level of significance indicates a no significant difference in the mean achievement scores of the two groups. It shows that the mean achievement scores of students taught with peer tutoring strategy was higher than those taught with conventional method. It has significant effect on the academic achievement of students in mathematics. This was in tune with the findings of Suan (2014) who asserted that teacher factor, such as teaching styles, mastery of the subject matter, instructional techniques and strategies, classroom management, communication skills, and personality are all determinants of achievement. It corroborated the reports of Ali and Awatif (2014), and Oviawe Ezeji and Uwameiye (2015) who established that peer tutoring is more effective than the teacher-centered method of instruction. It supported the finding of Clement (2013), that associated student's failure in mathematics with teachers' teaching practices, that is what teachers do in the classroom, how teachers apply instructional methods and traditional ways of teaching. Such as lecture style teaching, teacher centre methods and rote memorization in teaching mathematics

The finding revealed that there is no significant difference in the mean achievement scores of male and female students exposed to peer tutoring teaching strategy and conventional teaching method. This finding buttressed the proposition of Oviawe and Uwameiye. (2015) who reported that there is no significant interaction effect of gender and teaching methods on students' performance. However, this work is in deviance with the study of Ezenwosu and Nworgu (2013) who submitted that male students performed better than their female counterparts and the difference is significant. Also, this work supported the work of Adedeji (2013) who ascertained that peer tutoring instructional techniques helped pupils to gain more knowledge irrespective of pupil's ability and gender.

Conclusion

Peer tutoring is seen as an instructional strategy that can be adopted at all levels of our educational system. It was concluded that peer tutoring is an effective learning/teaching strategy which encouraged active participation of students in teaching and learning processes.

Recommendations

The following recommendations should be considered:
1. Peer tutoring should be embraced in teaching and learning of mathematics to foster academic achievement.
2. For students to be actively involved and perform better it was recommended that Mathematics teachers should combine peer tutoring with conventional teaching method.
3. Government can organise workshop for proper grooming of teachers on peer tutoring strategy.
4. Teachers should serve as facilitator when using the strategy for proper monitoring of instructions.

References

Adedeji, T. (2013). The Effect of Peer Tutoring and Explicit Instructional Strategies on Primary
     School Pupils Learning Outcomes in Mathematics. *Bulgarian Journal of Science and Education Policy* (BJSEP), 7(1), 5-25.

Ali, A. and Awatif, A. (2014). Using Peer Computer-Mediated Corrective Feedback to Support
     EFL Learners' Writing. *Language Learning and Technology Journal*, 18(1), 76-95.

Clements, D. H. (2013). Instructional Practices and Student Math Achievement: Correlations
     from a study of math curricula. University of Denver Morgridge College of Education.

Ezenwosu, S. U. and Nworgu, L. N. (2013). Efficacy of Peer Tutoring and Gender on Students'
     Achievement in Biology. *International Journal of Scientific and Engineering Research*, 4(12), 944-950.

Oviawe, J. I., Ezeji, S. C. O. A. and Uwameiye, R. (2015). Comparative Effects of Three
     Instructional Methods on Students' Performance in Building Technology in Nigerian polytechnics. *European Scientific Journal*, 11(12), 274-285. [19]

Suan, I. (2014). A Critical Review of Leadership Styles on the Performance of Public
     Secondary Schools in National Examinations in Tana River County. Kenya

Tshabalala, T. & Ncuba, A. C. (2013). Causes of Poor Performance of Ordinary Level Pupils
     in Mathematics in Rural Secondary Schools in Nkayi District: Learner's Attributions. Nova Explore Publications: Zimbabwe