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Effect of peer tutoring strategy on mathematics achievement of secondary school students with different ability level in Oji-river local government area, Enugu state

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ABSTRACT

The study investigated the effect of peer tutoring strategy (PTS) on Mathematics achievement of secondary school students with different ability level in Oji-River local government area of Enugu state. Three research questions guided the study and three null hypotheses were tested at 0.05 level of significance. The quasi-experimental pretest posttest non-randomized control group design was adopted for the study. A sample of 88 senior secondary two (SS2) students of mathematics chosen from a population of 1,118 students in Oji-River LGA using random and purposive sampling were involved in the study. The instruments for data collection was Mathematics Achievement Test (MAT) validated by three experts. The reliability of the instrument was established using Kuder-Richardson Formula-20 to be 0.83.The experiment took place in two phases. The first phase involved a one-week training session for the research assistants, who are the regular SS2 Mathematics teachers in both the experimental and control group schools. This training consisted of three sessions, with details provided in the briefing manual.The second phase focused on the implementation of the treatment. Students in the experimental group received instruction using the Peer Tutoring Strategy (PTS), while those in the control group was taught through the lecture method. Before the treatment begins, all students took Mathematics Achievement Test (MAT) as a pretest. Scores obtained from the achievement pretests was recorded for both groups. The data obtained were analyzed using mean, standard deviation and Analysis of Covariance. The findings revealed among others that there is a significant difference between the mean achievement scores of secondary school students taught Mathematics using PTS and those taught using lecture method in favour of PTS, ability level had no significant influence on students' achievement in Mathematics. The study concludes that peer tutoring strategy significantly enhances secondary school students' achievement in Mathematics irrespective of students ability level. It was recommended among others that, schools should provide professional development programs to train mathematics teachers in effective use of peer tutoring strategy (PTS) to enhance students engagement and achievement in Mathematics.

INTRODUCTION

Education serves as the cornerstone for national development, equipping individuals with the knowledge and skills necessary to drive economic growth and societal progress. In developing countries like Nigeria, science education is particularly vital, as it fosters critical thinking, innovation, and technological advancement. Mathematics education is integral to science education, providing the essential language and analytical framework for scientific inquiry and problem-solving. Effective teaching and learning of mathematics at all levels of schooling in Nigeria as Onoshakpokaiye (2020)

averred, is crucial for the nation's development. By strengthening mathematics education, Nigeria can enhance its scientific capabilities, leading to innovations that address local challenges and contribute to global scientific discourse. Despite its significance, many secondary school students in Nigeria continue to struggle with mathematics, leading to widespread concerns about their academic achievement.

Students' performance in Mathematics in Nigeria from 2019 to 2024 for instance, has experienced fluctuations due to various factors such as government policies, resource availability, and external challenges like the COVID-19 pandemic. In 2019, about 64.18% of candidates according to the West African Senior School Certificate Examination (WASSCE) Chief Examiner's Report, obtained credit-level passes (grades A1 to C6) in Mathematics. The following year, in 2020, there was a slight improvement as the pass rate increased to 65.24%, despite the disruptions caused by the pandemic. In 2021, there was a significant rise in performance, with 81.70% of students attaining the required credits, marking the highest pass rate within this period. However, in 2022, there was a decline to 76.36%, followed by a marginal increase in 2023, where 79.81% of students secured credit-level passes. In 2024, performance dipped again, with 72.12% of candidates passing Mathematics at the required level. These variations highlight the need for continuous efforts to strengthen Mathematics education in Nigeria to ensure consistent improvement in students' academic achievements.

The performance of students in Mathematics specifically in Enugu State, Nigeria, has generally reflected the national trend, characterized by fluctuating success rates in external examinations like the West African Senior School Certificate Examination (WASSCE) and the National Examination Council (NECO) exams (Ezepue, Nduka & Nweke, 2025). Over the years, students' achievement in Mathematics has been influenced by factors such as teacher quality, availability of instructional resources, and students' attitudes toward the subject. While some schools according to Eze & Okonkwo (2023), have recorded commendable pass rates, many schools struggle with Mathematics, leading to lower performance levels. The trend in recent years has shown a mix of improvement and decline, depending on the specific year and examination body. Some reports indicate that a significant percentage of students achieved credit-level passes (A1–C6), but a substantial number still fall below the required benchmark for tertiary education admission. Challenges such as inadequate teaching methodologies, lack of access to digital learning resources, and students' anxiety towards Mathematics may contribute to the inconsistent performance (Eze & Okonkwo, 2023). However, efforts by the state government and educational stakeholders, including teacher training programs and curriculum improvements, continue to play a crucial role in enhancing students' Mathematics performance in Enugu State.

The incessant fluctuations between satisfactory and unsatisfactory achievement of students in mathematics has been attributed to various factors, including ineffective teaching strategies, lack of motivation, and individual differences in learning abilities (Animudu, 2023; Ezepue, Nduka & Nweke, 2025; Nwigwe & Osuafor, 2019). Enhancing teaching methodologies, refining curriculum content, and providing adequate resources will be essential in ensuring sustained and improved student outcomes in Mathematics. As a result, educators and researchers have sought innovative instructional approaches to enhance students' comprehension and performance in mathematics. Such approach that has gained attention is the peer tutoring strategy which fosters collaborative learning and active engagement among students.

Peer tutoring according to Falchikov (2020) is an instructional technique where students help one another learn by providing academic support, guidance, and explanation of concepts. It involves a more knowledgeable or skilled student (the tutor) assisting a less knowledgeable peer (the tutee) in understanding a subject or solving problems. Peer tutoring is technique where students, usually of similar or varying academic abilities, assist one another in learning and understanding subject matter (Muriithi & Muthaa, 2023). This method creates a supportive learning environment where students

can explain concepts in their own words, ask questions, and clarify doubts, leading to improved understanding and retention of mathematical concepts. Researcher (Ohtani & Hisasaka, 2020) has shown that peer tutoring bear potentials that could significantly enhances students' academic achievement by promoting personalized learning and active participation. This positive effect of the technique is attributed to the interactive nature of peer tutoring, which encourages students to engage more deeply with the subject matter, thereby fostering a more profound comprehension of mathematical principles leading to improved academic achievement. Achievement levels however, among students vary significantly due to differences in cognitive abilities, learning styles, and prior knowledge.

The concept of ability levels in education refers to the varying degrees of proficiency among students, which can generally be classified as high, medium, or low (Roka, 2022). Ability level refers to an individual's capacity to perform tasks, solve problems, and acquire knowledge within a particular domain. It represents variations in cognitive, academic, or skill-based competencies among learners, influencing their learning pace, comprehension, and overall performance (Snow, 2018). In an educational context, students are often grouped based on ability levels to tailor instruction to their specific needs, ensuring optimal learning outcomes (Tomlinson, 2019). Recognizing these differences is essential for effective teaching, as students at different ability levels require instructional methods that cater for their specific learning needs. Studies by Mckeen (2019), suggest that peer tutoring is particularly beneficial for students across all ability levels, as it provides opportunities for peer interaction, scaffolding, and individualized instruction. High-ability students benefit by reinforcing their knowledge through teaching others, while low- and medium-ability students gain from the additional explanations and support provided by their peers. The context of Oji-River Local Government Area in Enugu State highlights some challenges faced by students in mathematics education with respect to ability level as is common in other education settings. Like many other regions in Nigeria, Oji-River may also struggle with inadequate teaching resources, overcrowded classrooms, and a shortage of qualified mathematics teachers. These challenges could further worsen the learning difficulties experienced by students, particularly those with lower ability levels. Given these challenges, implementing peer tutoring as a teaching strategy in Oji-River secondary schools could provide a cost-effective and efficient means of improving mathematics achievement among students, regardless of their ability levels.

Purpose of the Study

The purpose of the study was to investigate the effect of peer tutoring strategy on mathematics achievement of secondary school students with different ability level in Oji-river local government Area of Enugu state. Specifically, the study seeks to determine the:

1. Mean achievement scores of students taught Mathematics using peer tutoring strategy (PTS) and those taught using lecture method (LM).
2. Mean achievement scores of high, middle and low ability students taught Mathematics using PTS and those taught using LM.
3. Interaction effect of methods (PTS, LM) and ability level (High, middle and low) on students' achievement in Mathematics.

Research Questions

1. What are the mean achievement scores of students taught Mathematics using peer tutoring strategy (PTS) and those taught using lecture method (LM)?
2. What are the mean achievement scores of high, middle and low ability students taught Mathematics using PTS and those taught using LM?

Hypotheses

The following null hypotheses were tested at 0,05 level of significance:

1. There is no significant difference between the mean achievement scores of students taught Mathematics using peer tutoring strategy (PTS) and those taught using lecture method (LM).
2. There is no significant difference between the mean achievement scores of high, middle and low ability students taught Mathematics using PTS and those taught using LM.
3. There is no interaction effect between the teaching methods (PTT, LM) and ability levels (High, middle and low) on students' Mathematics achievement.

2. METHODOLOGY

The study utilized a quasi-experimental design, specifically a pretest-posttest non-randomized control group design. The area of study is Oji-River Local Government Area (LGA) of Enugu State, Nigeria. The population of the study comprised 1,118 SS2 mathematics students in the secondary schools in Oji-River local government area of Enugu state. The study involved a sample of 88 SS2 students enrolled in Mathematics in Oji-river LGA. The instrument for data collection was Mathematics Achievement Test (MAT). The MAT consisted of 50 multiple-choice questions on statistics concepts, adapted from past West African Examination Council (WAEC) Exam questions from 2021 to 2024, aligning with the lessons taught. MAT is divided into two sections: Section A gathered demographic information, while Section B contains the test questions. Each question had four answer options labelled A to D. Students earned two marks for each correct response, with a total possible score of 100. The marking scheme is provided and a Table of Specification was used to ensure that all instructional units were adequately represented in the MAT.

Lesson plans were developed as treatment packages, incorporating the selected teaching techniques. While the lesson content remains consistent across groups covering the topics of: measures of central tendency and dispersion, Frequency distribution, mean and mode of ungrouped data, mean and mode of grouped data, variations exist in the instructional methods and student activities. The experimental groups received instruction using the peer tutoring strategy, whereas the control group was taught using the lecture method. The instruments, scope, research questions, hypotheses, and lesson plans were validated by two lecturers from the Departments of Science Education and one lecturer from the Department of Educational Foundations (Measurement and Evaluation Unit) all from Nnamdi Azikiwe University, Awka. The reliability of MAT was assessed using the Kuder-Richardson Formula 20 (KR-20) since the instrument consists of dichotomously scored items. The coefficient of internal consistency obtained was 0.83.

The experiment took place in two phases. The first phase involved a one-week training session for the research assistants, who are the regular SS2 Mathematics teachers in both the experimental and control group schools. This training consisted of three sessions, with details provided in the briefing manual. The second phase focused on the implementation of the treatment. Students in the experimental group received instruction using the Peer Tutoring Technique (PTT), while those in the control group was taught through the lecture method. Before the treatment begins, all students took Mathematics Achievement Test (MAT) as a pretest. Scores obtained from the achievement pretests was recorded for both groups.

Data for the study was generated by giving the instrument to students as both pretest and posttest. The data on the research questions was analyzed using mean and standard deviation, while the hypotheses were tested using analysis of covariance (ANCOVA) at a 0.05 significance level. ANCOVA was employed to control for initial differences among the student groups. The decision criterion for accepting or rejecting the null hypotheses was based on the probability value (p-value). If the p-value was greater than 0.05 ($P > 0.05$), the null hypothesis was not rejected. However, if the p-value was less than or equal to 0.05 ($P \leq 0.05$), the null hypothesis was rejected.

3. RESULTS

Table 1: Mean Achievement Scores of Students taught Mathematics using Peer Tutoring strategy (PTS) and Lecture Method

Group	*N*	Pretest Mean	Pretest *SD*	Posttest Mean	Posttest *SD*	Gained Mean
PTS	43	32.02	9.28	71.26	8.71	39.24
LM	45	32.04	7.24	57.31	8.87	25.27

Table 1 shows that students taught Mathematics using PTS had pretest mean achievement score of 32.02 and posttest mean achievement score of 71.26 with gained mean achievement score of 39.24, while those taught Mathematics using lecture method had pretest mean achievement score of 32.02 and posttest mean achievement score of 57.31 with gained mean achievement score of 25.27. Students taught Mathematics using PTS had a less homogeneous score in their pretest (9.28) than those taught using LM (7.24). In the posttest, students taught Mathematics using PTS had a more homogeneous score (8.71) than those taught using LM (8.87). The use of PTS reduced the heterogeneity of score for students in the experimental group.

Table 2: Mean Achievement Scores of High, Middle and Low Ability Students taught Mathematics using Peer Tutoring strategy (PTS) and Lecture method (LM)

Method	Ability	*N*	Pretest Mean	Pretest *SD*	Posttest Mean	Posttest *SD*	Gained Mean
PTS	High	12	25.83	7.74	68.75	7.67	42.92
	Middle	22	35.55	7.99	72.77	8.47	37.22
	Low	9	31.67	10.48	70.89	10.64	39.22
LM	High	8	36.50	5.53	59.12	9.39	22.62
	Middle	26	30.69	7.82	56.23	9.53	25.54
	Low	11	32.00	5.97	58.55	7.06	26.55

Table 2 shows that the high ability students taught Mathematics using PTS had a gain in mean achievement scores of 42.92, with the middle ability students having a gain in mean achievement scores of 37.22 where the low ability students had 39.22. Table 2 also reveals that the high ability students taught Mathematics using LM had a gain in mean achievement scores of 22.62, with the middle ability students having a gain in mean achievement scores of 25.54 where the low ability students had 26.55. High ability students taught using PTS had a more homogeneous score in the posttest than the middle and low ability students whereas low ability students taught using LM had the most homogeneous scores than the high and middle ability students.

Table 3 shows that there is a significant main effect of the treatment on students' achievement in Mathematics, $F(1, 75) = 48.642$, $P = .000 < 0.05$. Therefore, the null hypothesis is rejected meaning that there is a significant difference between the mean achievement scores of students taught Mathematics using peer tutoring strategy (PTS) and those taught using lecture method (LM) in favour of PTS. Table 3 also shows that there is no significant main influence of ability level on students' achievement in Mathematics, $F(2, 75) = 0.021$, $P = .980 > 0.05$. Therefore, the null hypothesis is not rejected meaning that there is no significant difference between the mean achievement scores of high, middle and low ability students taught Mathematics using PTS and those taught using LM.

Table 3 more so shows that there is no significant interaction effect of the teaching methods and ability level on students' achievement in Mathematics, $F(2, 75) = 0.102$, $P = .903 > 0.05$. Therefore, the null hypothesis was not rejected meaning that there is no significant interaction effect

between the teaching strategy (PTS, LM) and ability level (High, middle and low) on students' Mathematics achievement as shown below in Figure 1.

Table 3: ANCOVA Test of Significance of Difference in the Mean Achievement of Students taught Mathematics using PTS and LM

Source	Type III SS	df	Mean Square	F	Sig.	Dec.
Corrected Model	6530.713[a]	12	544.226	9.300	.000	
Intercept	9874.651	1	9874.651	168.743	.000	
Pretest	1071.247	1	1071.247	18.306	.000	
Method	2846.501	1	2846.501	48.642	.000	Sig.
Ability Level	2.413	2	1.207	.021	.980	N.Sig.
Method * Ability	11.914	2	5.957	.102	.903	N.Sig.
Error	4388.912	75	58.519			
Total	372777.000	88				
Corrected Total	10919.625	87				

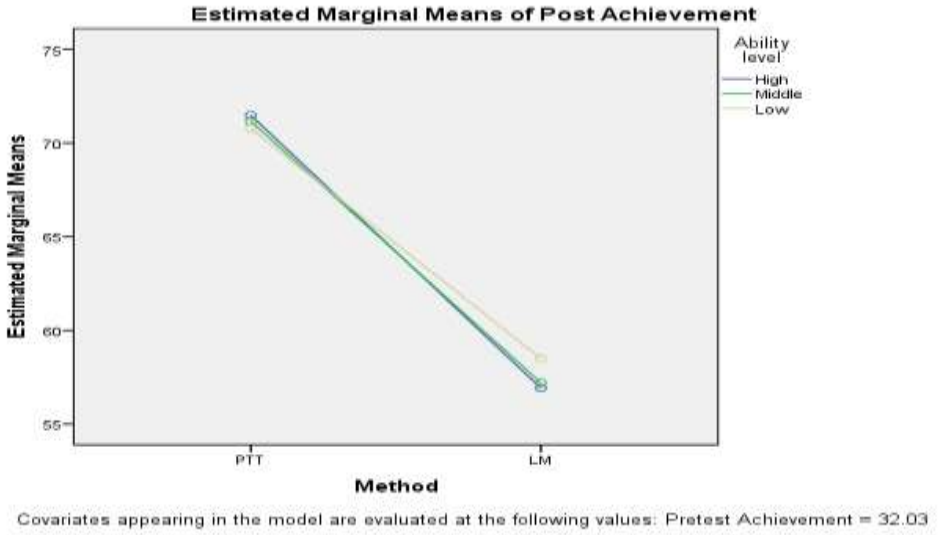

Figure 1: Plot of interaction effect of teaching t strategy (PTS and LM) and ability level on students' achievement in Mathematics

The plot of interaction effect of teaching strategy and ability level on students' achievement in Mathematics as shown in Figure 1 is non-significant and disordinal. This shows that the teaching strategy had dissimilar effect with respect to ability level and are therefore ability-level sensitive.

Table 1: Mean Achievement Scores of Students taught Mathematics using Peer Tutoring strategy (PTS) and Lecture Method

Group	***N***	**Pretest Mean**	**Pretest *SD***	**Posttest Mean**	**Posttest *SD***	**Gained Mean**
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homogeneous score (8.71) than those taught using LM (8.87). The use of PTS reduced the heterogeneity of score for students in the experimental group.

Table 2: Mean Achievement Scores of High, Middle and Low Ability Students taught Mathematics using Peer Tutoring strategy (PTS) and Lecture method (LM)

Method	**Ability**	***N***	**Pretest Mean**	**Pretest *SD***	**Posttest Mean**	**Posttest *SD***	**Gained Mean**
PTS	High	12	25.83	7.74	68.75	7.67	42.92
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	Low	9	31.67	10.48	70.89	10.64	39.22
LM	High	8	36.50	5.53	59.12	9.39	22.62
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Error	4388.912	75	58.519			
Total	372777.000	88				
Corrected Total	10919.625	87				

Table 3 shows that there is a significant main effect of the treatment on students' achievement in Mathematics, $F(1, 75) = 48.642$, $P = .000 < 0.05$. Therefore, the null hypothesis is rejected meaning that there is a significant difference between the mean achievement scores of students taught Mathematics using peer tutoring strategy (PTS) and those taught using lecture method (LM) in favour of PTS. Table 3 also shows that there is no significant main influence of ability level on students' achievement in Mathematics, $F(2, 75) = 0.021$, $P = .980 > 0.05$. Therefore, the null hypothesis is not rejected meaning that there is no significant difference between the mean achievement scores of high, middle and low ability students taught Mathematics using PTS and those taught using LM. Table 3 more so shows that there is no significant interaction effect of the teaching methods and ability level on students' achievement in Mathematics, $F(2, 75) = 0.102$, $P = .903 > 0.05$. Therefore, the null hypothesis was not rejected meaning that there is no significant interaction effect between the teaching strategy (PTS, LM) and ability level (High, middle and low) on students' Mathematics achievement as shown below in Figure 1.

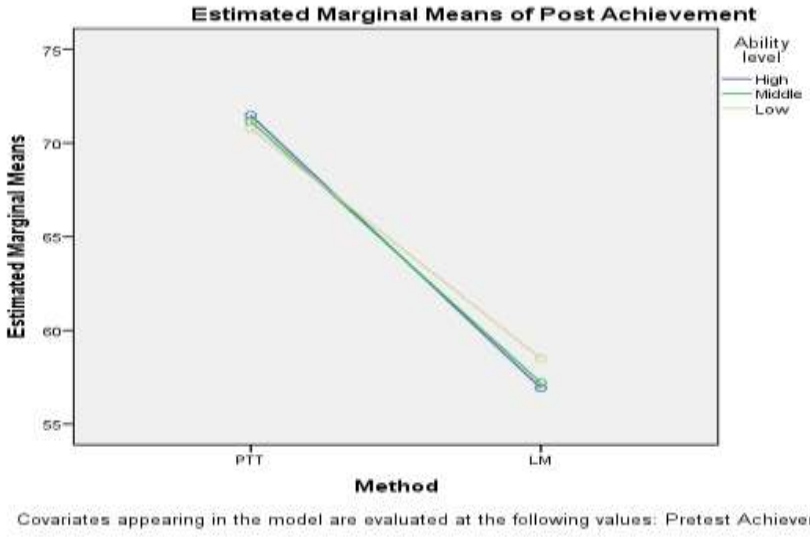

Figure 1: Plot of interaction effect of teaching t strategy (PTS and LM) and ability level on students' achievement in Mathematics

The plot of interaction effect of teaching strategy and ability level on students' achievement in Mathematics as shown in Figure 1 is non-significant and disordinal. This shows that the teaching strategy had dissimilar effect with respect to ability level and are therefore ability-level sensitive.

Discussion

The findings of the study revealed a significant difference in the mean achievement scores of students taught Mathematics using the peer tutoring strategy (PTS) compared to those taught with the lecture method, with PTS producing better results. This effectiveness was attributed to increased engagement, active participation, collaboration, immediate feedback, and personalized support provided through peer tutoring, unlike the lecture method which often takes a one-size-fits-all approach. The findings agree with AbdulRaheem, Yusuf, and Odutayo (2017), Lazarus (2014), Agu and Samuel (2018), and Samuel and Sambo (2019), who similarly reported that peer tutoring improved achievement in subjects like Economics, Mathematics, and Science by fostering deeper comprehension, retention, and supportive environments. Collectively, these studies affirm that peer tutoring is superior to lectures in enhancing students' academic achievement and should be more widely adopted in subjects such as Mathematics where abstract concepts challenge students.

The study further found no significant difference in the mean achievement scores of high, middle, and low-ability students taught Mathematics using PTS compared to those taught with lecture method, suggesting that effectiveness of PTS does not vary across ability levels. This could mean that while peer tutoring fosters interaction, it may not adequately address distinct cognitive needs of different abilities, or that a well-structured lecture can equally meet the needs of all students in Mathematics. These results align with Saleh, Lazonder, and De Jong (2005), Thomas and Feng (2014), and Mckeen (2019), who found that collaborative or grouping strategies improved classroom dynamics and motivation but did not necessarily lead to significant achievement differences across abilities. Similarly, Betts and Shkolnik (2000) noted that ability grouping influenced interactions but had negligible impact on measurable achievement compared to traditional methods.

CONCLUSION

Based on the findings, it can be concluded that peer tutoring strategy significantly enhances secondary school students' achievement in Mathematics compared to the traditional lecture method. This suggests that students benefit more academically when engaged in interactive, peer-supported learning environments that promote deeper understanding. Therefore, peer tutoring is a more effective

instructional strategy for improving students' Mathematics achievement. The study recommends as follow:

1. Schools should provide professional development programs to train Mathematics teachers in effectively implementing peer tutoring strategy (PTS) to enhance student engagement and achievement in Mathematics.
2. Educational policymakers should formally incorporate PTS into curricula and teaching guidelines to promote its structured adoption across classrooms.
3. Schools should cultivate a collaborative learning culture by encouraging and incentivizing peer tutoring among students to reinforce understanding and academic success.

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