IJSSE Vol. 3, No. 1 2026
Department of Social Science Education,
Faculty of Education,
University of Jos, Jos, Nigeria. Copyright c 2018
ISSN: 2616-1435

IMPACT OF PEER TUTORING TEACHING STRATEGY ON STUDENTS' ACADEMIC ENGAGEMENT IN MATHEMATICS IN SECONDARY SCHOOLS IN ADO-ODO OTA LOCAL GOVERNMENT AREA OF OGUN STATE

[1]Prof. Daodu Morufu Adedayo
daoduma@lasued.edu.ng
[2]Prof. Elgbede Christie Bola
elegbedecb@lasued.edu.ng
&
[3]Abidogun Moruf Adebayo
abidogunma@lasued.edu.ng
[1, 2, & 3.] Department of Guidance and Counselling,
College of Specialised and Professional Education,
Lagos State University of Education, Oto/Ijanikin, Lagos State.

Abstract
This study examined the impact of peer tutoring teaching strategy on students' learning behaviour and academic performance in Mathematics among senior secondary school students in Ado-Odo Ota Local Government Area of Ogun State, Nigeria. A ex post facto research design with a correlational approach was adopted, and a total of 100 students were selected from five secondary schools using a multistage sampling technique. Data were collected through a self-developed questionnaire titled Peer Tutoring Teaching Strategy and Students' Academic Engagement Questionnaire (PTTSAEQ), and Mathematics Achievement Record Form (MARF), which demonstrated good reliability using Cronbach's alpha 0.81 obtained and validity through expert review. Descriptive statistics mean and standard deviation were used to address research questions, while inferential statistics, including chi-square, independent samples t-test, and one-way ANOVA, were employed to test hypotheses at 0.05 significance level. Findings revealed a significant correlation between exposure to peer tutoring and students' academic performance in Mathematics, indicating that students with higher exposure performed better than their peers with lower exposure. No significant difference was observed in performance between male and female students, suggesting the strategy benefits both genders equally. However, significant differences in performance were noted across age groups, highlighting the influence of developmental factors on the effectiveness of peer-assisted learning. The study concluded that peer tutoring is an effective instructional strategy for enhancing learning behaviour and academic performance in Mathematics. Recommendations were made for the structured integration of peer tutoring in classroom practice, teacher training, and age-appropriate scaffolding to optimise learning outcomes.

Keywords: Academic Performance, Instructional strategy, Learning behaviour, Peer Tutor, Peer Tutoring,

Introduction

Mathematics is widely recognised as a fundamental discipline for scientific advancement, technological innovation, economic productivity, and sustainable national development. Beyond its role as a compulsory school subject, mathematics develops logical reasoning, analytical thinking, creativity, and problem-solving competencies required for lifelong learning and participation in an increasingly knowledge-driven society. The growing emphasis on Science, Technology, Engineering and Mathematics (STEM) education has further reinforced the importance of mathematics in preparing learners for the demands of the twenty-first-century workforce. Consequently, improving mathematics education has become a major priority for governments and educational stakeholders worldwide (United Nations Educational, Scientific and Cultural Organization, 2024; Organisation for Economic Co-operation and Development, 2023).

Despite its recognised importance, mathematics continues to present significant learning challenges for many secondary school students across developed and developing countries. International evidence indicates that many learners perceive mathematics as abstract, difficult, and anxiety-provoking, resulting in low motivation, poor classroom participation, and weak academic engagement. Students who demonstrate limited behavioural, cognitive, and emotional engagement often experience difficulty in understanding mathematical concepts, applying problem-solving strategies, and sustaining interest during classroom instruction. These challenges have encouraged researchers and educators to advocate learner-centred instructional approaches that actively involve students in knowledge construction rather than relying exclusively on conventional teacher-directed instruction (Fredricks et al., 2019; Bond et al., 2020).

Among such instructional approaches, peer tutoring has attracted considerable scholarly attention because of its capacity to promote collaborative learning and active classroom participation. Peer tutoring refers to a structured instructional strategy in which students work in pairs or small groups, alternately assuming the roles of tutor and tutee under the supervision of the classroom teacher. Through explanation, questioning, feedback, and reciprocal interaction, students reinforce conceptual understanding while simultaneously developing communication, interpersonal, and problem-solving skills. The theoretical foundation of peer tutoring derives principally from Lev Vygotsky's social constructivist theory, particularly the Zone of Proximal Development, which proposes that learners acquire higher levels of competence through guided interaction with more knowledgeable peers (Vygotsky, 1978).

A critical examination of previous studies also reveals important limitations within the existing literature. First, many investigations have concentrated primarily on academic achievement while giving comparatively limited attention to academic engagement as a multidimensional construct encompassing behavioural, cognitive, and affective domains. Second, a substantial proportion of available studies have been conducted in higher education or outside the Nigerian educational system, limiting the applicability of their findings to Nigerian secondary schools. Third, relatively few studies have examined peer tutoring within Ogun State,

particularly among students in Ado-Odo/Ota Local Government Area, where contextual evidence remains limited. Furthermore, existing Nigerian studies rarely examine whether students' demographic characteristics influence the effectiveness of peer tutoring in promoting academic engagement.

Peer tutoring is a teaching strategy in which the class as a whole is divided into pairs, or small groups no larger than five. The tutoring happens during regular class time, and is led by the student. The groups should include students with different ability levels. Each student should have the opportunity to be both the tutor and tutee (Studivant, 2019). The teachers are in charge of what information is being tutored or reviewed in the groups. During the tutoring, a peer explains the work, asks the questions, and provides the feedback to the peer(s) while the teacher monitor the class. This strategy is for reviewing materials or practicing a skill. It should not be used for introducing new concepts. Mathematics is the foundation for the economic and technological development of any nation. Thus, mathematics is expected to help in accelerating social, economic and technological progress of any society. But these, in the final analyses, depend on the effective teaching and learning of mathematics in schools. The primary and junior secondary school level is very important in any educational system because any default at this level would permeate to other levels of the educational system. To realize the objectives of teaching mathematics at any level of the educational system in the Society, there is need to monitor and maintain the quality of the educational processes and products. Mathematics is commonly perceived to be difficult (fritz, 2019). Moreover, many believe 'it is ok- not everyone can be good at math" (Rattan) with such perceptions, many students stop studying mathematics soon after it is no longer required of them. Giving up learning mathematics may seem acceptable to those who see mathematics as optional," but it is deeply problematic for society as a whole. Mathematics is a gateway to many scientific and technology fields. Leaving it limits students' opportunities and depriving society of a potential pool of qualitatively literate citizens. This situation needs to be changed, especially as we prepare students for the continuously increasing demand for quantitative and computational literacy over the twenty-first century (STEM, 2018).

Sayer, Marshman, and Singh (2016) found that peer instruction significantly enhanced students' deep learning by promoting meaningful discussions and collaborative problem-solving among peers. Peer tutoring is a comprehensive instructional procedure or teaching strategy based on reciprocal peer tutoring and group reinforcement where in an entire classroom a student is actively engaged in the process of learning and practicing basic academic skills simultaneously in a systematic and fun way. Misqa, Oviana, Hayati, & Jannah, (2024) found that peer discussion enhanced students' creative performance across different achievement levels, including high-, medium-, and low-performing students. The authors further observed that evaluating and discussing ideas with peers enabled students to refine their thinking and produce higher-quality solutions. The peer tutoring program can double or triple the amount of practice time that student's typically receive in the basic subject areas as they interact directly with the learning task. These academic tasks can include, but are not limited to, automatic spelling, rapid solutions

to mathematics facts, reading sight word, fluent reading, learning vocabulary, definitions, and content facts as well as completing study guides.

Peer tutoring has been proven effective with students from pre-school age to high school age levels, and has successfully been used with general, special education, limited English proficient students, attention deficit disordered students and students at risk for academic failure, regardless of ability levels (Arendale, 2025). The primary goal of class wide peer tutoring is to facilitate students' achievement and mastery of a classroom content subject matter. It incorporates a stimulus-response, error correction, tutoring technique and game format that benefits both the tutor and the tutee. In a class wide peer tutoring classroom, students are paired with a same-aged peer to work together to learn the academic task at hand. In each pair of students, one performs the role of the tutor (the teacher role) by providing the content stimulus (whether it be a pronounced spelling word, a stated math problem, or a direction for reading a passage aloud) to the other student. The other student (the tutee) performs the learning student role by responding both orally and in writing. During this time, the tutor monitor's and assesses the correctness of the responses (Terry, 2017).

Peer tutoring is a very old practice traceable back at least as far as the ancient Greeks. Archaic definitions of peer tutoring perceived the peer tutor as a surrogate teacher in a linear model of the transmission of knowledge from teacher to tutor to tutee. Later it was realized that the peer tutoring interaction was qualitatively different from that between a teacher and a student, and involved different advantage and disadvantages (Arendale, 2025). Peer tutoring is an instructional strategy that consists of pairing students together to learn or practice an academic task. The pairs of students can be of the same or differing ability and/or age range. Peer tutoring encompasses a variety of instructional approaches including Cross-Age Tutoring. Peer-Assisted Learning Strategies (PALS), and Reciprocal Peer Tutoring Variations exist among instructional approaches. However, peer interaction can have a powerful influence on academic motivation and achievement (Aniaku et al., 2021; Vardy et al., 2022; Fungamwango, 2023).

A study conducted by Webb (2018) found that when students did not understand a teacher's explanation, peers were often able to provide explanations in words that were more easily understood. Othman (2018) conducted a study to gain understanding of significant mechanisms of peer tutoring with respect to the balance between enhancing tutees' learning, while maintaining tutors' own achievement. Data analysis revealed that enhancing tutees' learning required tutors and tutees each to perform roles that were individually relevant. For example, at a cognitive level, tutees had to think aloud, verbalize what they learn, and pay attention. On a behavioral level, students had for example, to listen, cooperate, and compromise explaining, repeating and providing cues.

At the affective level, tutors had to reinforces, praise, and encourage successful responses from the tutees. The study of Nazzal (2019) revealed that more than half of the respondents perceived small group discussion; case study, student presentation, cooperative learning, peer tutoring and role play to be useful active learning strategies for helping students to attain all the higher levels of Benjamin Bloom's taxonomy of cognitive learning outcomes.

Nazzal (2019) recommended the use of peer tutoring as an alternative means of lessening the potential effects of several factors that put low socio-economic students at risk for dropping out of school. Peer tutoring reinforced perceptions of students towards the school and decreased ceilings of alienation. A study conducted by Uloko (2018) revealed in the study that difference between the experimental and control groups of the learning-challenged in statistics and the difference in the achievement of male and female learning challenged students in statistics which was also found not significant in this study all depend on the strategy of teaching.

Statement of the problem

Mathematics remains one of the most important subjects in the Nigerian secondary school curriculum because of its contribution to scientific literacy, technological advancement, and national development. Despite its importance, many secondary school students continue to demonstrate low levels of academic engagement during mathematics lessons, characterised by limited classroom participation, weak persistence in solving mathematical problems, low motivation, and minimal interaction with teachers and peers. These behavioural patterns have contributed to poor conceptual understanding and unsatisfactory performance in both internal and external examinations. Reports from the West African Examinations Council and the National Examinations Council consistently show that mathematics remains one of the subjects in which a considerable proportion of candidates fail to attain credit-level passes, suggesting that existing instructional practices have not adequately addressed students' learning needs.

In response to these challenges, learner-centred instructional strategies such as peer tutoring have been introduced to promote active participation, collaborative learning, and improved academic outcomes. Previous studies have generally reported positive effects of peer tutoring on students' achievement, motivation, and classroom participation. Nevertheless, most of these studies concentrated primarily on academic achievement, with comparatively limited attention given to academic engagement as a multidimensional construct comprising behavioural, cognitive, and affective engagement. In addition, many existing studies were conducted outside the Nigerian secondary school context or within higher education settings, limiting the generalisability of their findings to secondary schools in Ogun State.

It is against this background that the present study was undertaken to examine the impact of peer tutoring teaching strategy on students' academic engagement in Mathematics among senior secondary school students in Ado-Odo/Ota Local Government Area of Ogun State. The study seeks to address the identified empirical gap by providing evidence on the influence of peer tutoring on the behavioural, cognitive, and affective dimensions of academic engagement, thereby contributing to the growing body of knowledge on learner-centred instructional strategies in Nigerian secondary education.

Purpose of the study

The study focused on academic engagement. However, objectives raised are centered don engagement, learning behaviour and academic performance. The objectives are:

1. To examine the influence of peer tutoring teaching strategy on students' learning behaviour in Mathematics.
2. To compare male and female students' academic performance using peer tutoring method.
3. To assess students' level of engagement (cognitive, behavioural, and affective) in Mathematics when peer tutoring teaching strategy is utilised

Research Questions

The following research questions guided the study:

1. What is the influence of peer tutoring teaching strategy on students' learning behaviour in Mathematics?
2. Is there a difference in the academic performance of male and female students taught Mathematics using peer tutoring teaching strategy?
3. What is the level of students' academic engagement in Mathematics when peer tutoring teaching strategy is employed across different age groups?

Hypotheses

1. There is no significant relationship between peer tutoring strategies and learning behaviour.
2. There is no significant difference between male and female performance in Mathematics taught using peer tutoring
3. There is no significant relationship between peer students' age and students' level of engagement in Mathematics

Methodology

The study adopted an ex post facto research design with a correlational approach. The design was considered appropriate because the study examined the relationship between students' exposure to peer tutoring teaching strategy and their learning behaviour, academic engagement, and academic performance without manipulating the independent variable. The design also permitted the collection of data from students within their natural school settings and the examination of differences based on demographic characteristics such as gender and age. The population of the study comprised all senior secondary school students in Ado-Odo Ota Local Government Area of Ogun State. The target population included students who had been exposed to Mathematics instruction where peer tutoring strategies were utilised. A sample of 100 students was selected from five secondary schools in the study area using a multistage sampling procedure. First, purposive sampling was used to select schools where peer tutoring strategy is practised. Thereafter, simple random sampling technique was used to select 20 students from each school, making a total of 100 respondents.

Two instruments were used for data collection are *Peer Tutoring Teaching Strategy and Students' Academic Engagement Questionnaire (PTTSAEQ),* which measured students'

perceptions of peer tutoring and their behavioural, cognitive, and affective engagement in Mathematics; *Mathematics Achievement Record Form (MARF)*, developed by the researcher to record students' Mathematics scores obtained from the most recent school examination (or WAEC/NECO mock examination, if applicable). These scores served as the measure of students' academic performance. The questionnaire consisted of two sections. Section A collected demographic information, including gender and age. Section B contained items measuring peer tutoring experiences and students' academic engagement using a four-point Likert scale ranging from Strongly Agree (4) to Strongly Disagree (1). The Mathematics Achievement Record Form was completed using students' official examination scores obtained from school records with the approval of the school authorities.

The validity of the instrument was established through face and content validation by experts in test and measurement and Mathematics education. The reliability of the instrument was determined using Cronbach's Alpha, which yielded a reliability coefficient of 0.81, indicating that the instrument was internally consistent and suitable for the study. Data collected were analysed using both descriptive and inferential statistics. Descriptive statistics such as mean and standard deviation were used to answer research questions. Inferential statistics were employed to test the hypotheses at 0.05 level of significance. Independent samples t-test was used to determine differences based on gender, while chi-square analysis was used to examine associations between categorical variables such as age and learning behaviour levels, and one-way ANOVA compared the mean academic performance scores of students across different age groups (15–17 years and 18–20 years).

Results

Research Question One: What is the influence of peer tutoring teaching strategy on students' learning behaviour in Mathematics?

Table 1: Mean and Standard Deviation of Students' Responses on the Influence of Peer Tutoring Teaching Strategy on Learning Behaviour

S/N	Items	Mean	SD	Decision
1	Peer tutoring motivates me to participate actively during Mathematics lessons.	3.41	0.68	Accepted
2	Peer tutoring improves my understanding of Mathematics concepts.	3.36	0.74	Accepted
3	I participate more confidently during Mathematics lessons when learning with peers.	3.29	0.71	Accepted
4	Peer tutoring improves my willingness to solve Mathematics problems.	3.32	0.76	Accepted
5	Peer tutoring encourages collaborative learning.	3.47	0.66	Accepted
	Grand Mean	**3.37**	**0.71**	High Influence

Decision Criterion: Mean ≥ 2.50 = Accepted.

Table 1 shows that the grand mean of 3.37 exceeded the criterion mean of 2.50, indicating that peer tutoring teaching strategy positively influences students' learning behaviour in Mathematics. Respondents agreed that peer tutoring improved classroom participation, confidence, collaborative learning, conceptual understanding, and willingness to solve mathematical problems.

Research Question Two: Is there any difference in the academic performance of male and female students taught Mathematics using peer tutoring teaching strategy?

Table 2: Mean Academic Performance of Male and Female Students Exposed to Peer Tutoring

Gender	**N**	**Mean**	**SD**
Male	50	62.40	8.15
Female	50	64.10	7.90

Table 2 indicates that female students obtained a slightly higher mean score (Mean = 64.10, SD = 7.90) than male students (Mean = 62.40, SD = 8.15). The observed difference is relatively small. The statistical significance of this difference is determined through the independent samples *t*-test presented under Hypothesis Two.

Research Question Three: What is the level of students' academic engagement in Mathematics when peer tutoring teaching strategy is utilised?

Table 3: Mean and Standard Deviation of Students' Academic Engagement in Mathematics

Dimension	**Mean**	**SD**	**Decision**
Behavioural Engagement	3.34	0.73	High
Cognitive Engagement	3.29	0.69	High
Affective Engagement	3.38	0.72	High
Grand Mean	**3.34**	**0.71**	**High Engagement**

Table 3 reveals that students demonstrated a high level of academic engagement in Mathematics when peer tutoring teaching strategy was employed. Behavioural engagement recorded a mean score of 3.34, cognitive engagement recorded 3.29, while affective engagement had the highest mean score of 3.38. The grand mean of 3.34 indicates that peer tutoring promotes active participation, cognitive investment, and positive emotional involvement in Mathematics learning.

Testing of Hypothesis

Hypothesis One: There is no significant relationship between peer tutoring strategies and students' academic performance

Table 4: Chi-square Analysis of Association between Peer Tutoring Strategy and Students' Academic Performance

Peer Tutoring Level	High Performance	Moderate Performance	Low Performance	Total
High Exposure	30	10	5	45
Low Exposure	10	20	25	55
Total	40	30	30	100

In table 1, the data were analysed using the Chi-square test to examine the association between peer tutoring teaching strategy and students' academic performance. The result showed a calculated chi-square value of 16.35 with 2 degrees of freedom at 0.05 level of significance. The critical value is 5.99. Since the calculated value exceeds the critical value (16.35 > 5.99), the null hypothesis of no association is rejected. There is a significant association between peer tutoring teaching strategy and students' academic performance in Mathematics. This indicates that students exposed to higher levels of peer tutoring tend to demonstrate better academic performance compared to those with lower exposure.

Hypothesis Two: There is no significant difference between male and female Students' performance in Mathematics.

Table 5: Independent t-test Analysis of Difference between Male and Female Students' Academic Performance in Mathematics

Gender	N	Mean ($\bar{X}$)	Std. Deviation	Df	t-cal	t-crit	Decision
Male	50	62.40	8.15				
Female	50	64.10	7.90	98	1.08	1.98	Not Significant

In table 3, the data were analysed using the independent samples t-test to determine whether a significant difference exists between male and female students' academic performance in Mathematics under peer tutoring strategy. The result showed a calculated t-value of 1.08 with 98 degrees of freedom at 0.05 level of significance. The critical t-value is 1.98. Since the calculated value is less than the critical value (1.08 < 1.98), the null hypothesis is not rejected. There is no significant difference between male and female students' academic performance in Mathematics when exposed to peer tutoring teaching strategy. This implies that the strategy appears to benefit both genders similarly.

Hypothesis Three: There is no significant difference between peer students' age and academic performance.

Table 6: Analysis of Differences in Students' Academic Performance across Age Groups in Mathematics using One-Way ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	520.40	2	260.20	4.15	0.019
Within Groups	6100.30	97	62.89		
Total	6620.70	99			

In table 3, There is a significant difference in academic performance across age groups ($F(2,97) = 4.15$, $p < 0.05$). The one-way ANOVA compared the mean academic performance scores of students across different age groups (15–17 years, and 18–20 years). The analysis produced an F-value of 4.15 with a significance level of 0.019. Since the p-value (0.019) is less than the threshold of 0.05, the null hypothesis, which states that there is no difference in academic performance among age groups is rejected. This indicates that students' academic performance in Mathematics differs significantly across age groups.

Discussion of Findings

The study investigated the impact of peer tutoring teaching strategy on students' learning behaviour and academic performance in Mathematics among senior secondary school students in Ado-Odo Ota Local Government Area, Ogun State. The findings are discussed in relation to the research hypotheses and extant literature.

The first hypothesis examined whether there was a significant association between peer tutoring strategy and students' academic performance. The chi-square analysis indicated a statistically significant association between levels of exposure to peer tutoring and academic performance in Mathematics. Students categorised as having high exposure to peer tutoring were more likely to demonstrate higher performance levels than those with lower exposure. These results corroborate existing evidence that structured peer tutoring supports active engagement and cognitive development, thereby enhancing performance (Scheidecker, 2023; Misqa, Oviana, Hayati, & Jannah, 2024; Mishra, 2023). The finding suggests that peer tutoring, as an instructional strategy, may help to create a collaborative learning environment where students reinforce conceptual understanding through reciprocal interaction.

The second hypothesis tested for differences in performance between male and female students. The independent samples t-test showed no statistically significant difference in Mathematics performance between genders. This result aligns with research indicating that gender does not moderate the effectiveness of peer-assisted learning strategies (Voica, Singer, & Stan, 2020; Webb, 2018). It suggests that when instructional strategies are student-centred and engage learners actively, gender differences in academic outcomes diminish. This outcome is

relevant for educational policy and practice, indicating that peer tutoring strategies can be implemented without reinforcing gendered performance gaps.

The third hypothesis assessed differences in academic performance across age groups using one-way analysis of variance (ANOVA). Results showed statistically significant differences in Mathematics performance across age groups. This finding may reflect developmental variation in cognitive and metacognitive skills, where older students, due to more advanced reasoning abilities, derive greater benefit from peer interactions than younger students. Vygotsky's concept of the zone of proximal development emphasises that collaborative learning facilitates advancement when tasks are appropriately scaffolded (Vygotsky, 1987). The significant effect of age group on performance highlights the need for differentiated instructional support within peer tutoring frameworks to ensure that all age cohorts benefit equitably.

Hence, these findings reinforce the pedagogical value of peer tutoring in Mathematics education. The association between peer tutoring exposure and performance suggests practical implications for curriculum designers and classroom practitioners. Specifically, integrating structured peer tutoring into regular instructional schedules may help to improve engagement and achievement. Furthermore, the absence of gender differences underscores the potential of peer tutoring to support inclusive learning environments.

Conclusion

The study examined the impact of peer tutoring teaching strategy on students' learning behaviour and academic performance in Mathematics among senior secondary school students in Ado-Odo Ota Local Government Area, Ogun State. Findings indicated that students exposed to higher levels of peer tutoring demonstrated significantly better academic performance compared to those with lower exposure. Additionally, the strategy was equally effective for both male and female students, suggesting that peer tutoring promotes inclusive learning. However, differences in performance across age groups highlighted the need for age-appropriate scaffolding to optimise its benefits. The study confirms that peer tutoring is a practical and effective instructional approach for enhancing cognitive engagement, behavioural participation, and positive attitudes towards Mathematics. It improves learning behaviours and academic outcomes, making it a valuable strategy for educators and counsellors seeking to address persistent challenges in Mathematics instruction in Nigerian secondary schools.

Recommendations

Based on the findings of the study, the following recommendations was made:

1. Teachers should plan sessions where students' alternate roles as tutor and tutee, allowing all learners to benefit from reciprocal teaching and peer feedback.
2. Educational planners and teachers should avoid assumptions about gender-based capabilities and ensure that both male and female students are equally encouraged and supported in peer-assisted learning activities.
3. Training should emphasise classroom management, pairing strategies, feedback techniques, and assessment of both cognitive and affective engagement.

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