

EFFECT OF PEER TUTORING ON ACHIEVEMENT MOTIVATION AMONG SENIOR SECONDARY SCHOOL STUDENTS IN PHYSICS IN GOMBE STATE, NIGERIA

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Abstract

This study investigated the effect of peer tutoring on the achievement motivation of senior secondary school students in Physics in Gombe state, Nigeria, with a focus on gender as a potential moderator. A quasi-experimental design, specifically a pre-test-post-test non-equivalent control group design was adopted. The study sampled 204 SS II Physics students from four co-educational public senior secondary schools using simple random sampling. The Academic Achievement Motivation Questionnaire (AAMQ) was used to collect data. Experts validated the questionnaire and the questionnaire was pilot tested to determine its reliability. The reliability coefficient of 0.80 was obtained using Cronbach's alpha. The descriptive statistics of mean and standard deviation were used to answer the research questions while the null hypotheses were tested using ANCOVA at a 0.05 significance level. Findings revealed that peer tutoring did not significantly enhance students' achievement motivation compared to conventional teaching methods. Additionally, no significant differences were observed between male and female students' motivation, nor was there a significant interaction effect of teaching method and gender on achievement motivation. These results suggest that while peer tutoring may improve academic performance in Physics, it does not inherently influence students' motivational levels. The study recommends integrating peer tutoring with additional motivational strategies and ensuring inclusive implementation to maximize student engagement.

Keywords: Peer Tutoring, Achievement Motivation, Physics.

Introduction

Physics is a cornerstone of STEM (Science, Technology, Engineering, and Mathematics) education, acting as a foundational discipline that enables students to understand fundamental principles of the natural world, including mechanics, thermodynamics, electromagnetism, and modern physics. Proficiency in physics is not just academically important; it is crucial for national development, technological innovation, and the development of critical-thinking and problem-solving competencies (Ojo & Denies, 2022). However, despite its importance, student achievement in physics, especially at the senior secondary school level, remains a persistent challenge in many parts of Nigeria, including Gombe state.

Achievement motivation, defined as the internal drive to pursue and persist in tasks, especially when difficulty arises, is recognized as an essential non-cognitive factor influencing academic performance (Maina & Moses, 2024). Students with high achievement motivation typically show greater persistence, set more challenging goals, and demonstrate resilient effort in their

studies (Ardura & Pérez-Bitrián, 2019; Dou, Brewe, Potvin & Zwolak, 2022). Conversely, students with low achievement motivation may disengage, underperform, or avoid demanding tasks altogether (Ardura & Pérez-Bitrián, 2019). In a subject like physics which is often perceived as abstract, difficult, and conceptually demanding high achievement motivation can be a decisive predictor of success.

Traditional physics instruction in many Nigerian secondary schools tends to be teacher-centered, dominated by lecture methods, rote memorization, and minimal student-student interaction. This pedagogical approach may limit opportunities for students to actively engage with concepts, ask questions, and develop a deep understanding (Ekeoha, 2024). Moreover, large class sizes, limited laboratory resources, and uneven teacher quality further compound these challenges, making it difficult for every student to receive the attention and scaffolding necessary for meaningful learning.

In response to these challenges, peer tutoring has emerged as a promising instructional strategy. Peer tutoring is a structured form of cooperative learning in which students help one another learn: high-achieving students may tutor peers, or students may alternate between tutor and tutee roles (reciprocal peer tutoring). The theoretical grounding for peer tutoring lies in social constructivist learning theory, particularly Vygotsky's zone of proximal development (ZPD), which argues that learners can progress to higher understanding when assisted by more capable peers (Vygotsky, 1978). In peer tutoring, learners scaffold each other's understanding, offer explanations in more relatable ways, and provide immediate feedback, which can enhance both cognitive outcomes (such as conceptual understanding and academic achievement) and motivational outcomes (such as self-efficacy and task persistence) (Celedonio & Elicay, 2024; Asare, 2025; Kareem & Ewuola, 2025).

Empirical studies in Nigeria support the potential of peer tutoring in science education. For instance, Maina and Moses (2024) reported that a peer collaborative learning strategy significantly improved both motivation and academic performance in physics among senior secondary students in Katsina State. Similarly, Okeke and Udegbe (2025) found that peer tutoring significantly enhanced students' achievement in algebra in Anambra State, though their results suggested some gender differences favoring male students. On the other hand, in Lagos State, Obaseki, Uzosike, and Ogbale (2024) showed that peer tutoring boosted students' achievement in chemistry, and importantly, they found no significant interaction with gender in their results. In basic science, Mamman (2025) conducted a quasi-experimental study in Kaduna State and also found that peer-tutoring significantly improved performance; moreover, gender did not moderate the effect, suggesting that peer tutoring may be a gender-friendly strategy. Beyond Nigeria, global research has also demonstrated the effectiveness of peer tutoring and peer instructional strategies in science education. For instance, Dou et al (2018) found in the United States that peer-to-peer interactions in active-learning physics classrooms significantly enhanced students' self-efficacy and interest, while Brundage, Malespina, and Singh (2023) reported in Canada that collaborative peer problem-solving in quantum mechanics facilitated co-construction of knowledge and improved conceptual understanding. Given the theoretical appeal and empirical support for peer tutoring, it becomes vital to investigate its effects in varied local contexts especially where educational challenges may moderate its effectiveness. In Gombe State, for instance, recent education reforms show both promise and urgency. The Gombe State Medium-Term Basic Education Strategic Plan (2024–2027) outlines a vision of “relevant, engaging and high-quality education ... that prepares every learner for good citizenship.” Simultaneously, a baseline mapping of basic education teachers in Gombe State revealed significant deficits in teacher quality, especially in rural areas, and

emphasized the need for capacity building and pedagogical innovation. The state government has also recently inaugurated a taskforce for basic education revitalization, tasked with designing transformative strategies to address longstanding deficits in teaching quality, resource provision, and school infrastructure. This policy environment suggests both political will and need for interventions that can rapidly and sustainably improve teaching and learning. Despite these reforms, there is a notable absence of rigorous, localized research on the impact of peer tutoring on achievement motivation in physics among senior secondary school students in Gombe State. If peer tutoring is effective in this context, it could complement the state's ongoing efforts, offering a cost-effective, scalable pedagogical innovation. Moreover, examining gender as a moderator is critical in Gombe State, where the need for a gender-responsive educational strategy has been emphasized by local stakeholders. Indeed, commentators have noted that without a gender-sensitive plan, existing efforts risk perpetuating disparities, especially for girls in rural areas. Therefore, this study filled this gap by investigating the effect of peer tutoring on the achievement motivation of senior secondary students in physics in Gombe State, with gender explicitly examined as a moderator variable.

Statement of the Problem

In an ideal educational environment, senior secondary school students studying physics would not only achieve high academic scores but also exhibit strong achievement motivation, characterized by resilience, persistence, intrinsic interest, and a desire to master the subject. Such motivated learners would actively participate in class, engage in peer discussions, ask thoughtful questions, and perceive physics as both personally meaningful and relevant to their future academic and career goals.

However, the current situation in Gombe state reveals significant challenges. Many senior secondary students continue to perform poorly in physics, despite its critical role in STEM pathways, limiting their potential progression into science and technology careers. Reports from teachers and research evidence indicate that achievement motivation in physics is often weak, with many students developing negative attitudes toward the subject, which correlates with lower engagement and achievement (Mahinay & Nabua, 2025). Students frequently avoid difficult conceptual topics and rely heavily on rote learning rather than deep understanding (Usman et al., 2019). Traditional physics classrooms remain largely teacher-centered, emphasizing lecture-based instruction and procedural problem-solving, which research has shown limits the development of expert-like beliefs and sustained effort on challenging tasks (Madsen et al., 2014). Moreover, large class sizes, limited laboratory resources, and minimal opportunities for peer discussion or individualized support further constrain student engagement and learning outcomes (Michael, 2021; Oladipo, 2022). Studies suggest that adopting more active, student-centered instructional approaches, such as cooperative learning and inquiry-based labs, can improve both motivation and conceptual understanding (Fraser et al., 2006).

The quality of teaching is another contributing factor, particularly in rural schools, as highlighted in the baseline mapping report of basic education teachers (Gombe State Ministry of Finance, 2025). Gaps in teacher capacity limit the ability to provide high-quality scaffolding, meaningful feedback, and personalized guidance to students. Although the state government has launched reforms under the Medium-Term Basic Education Strategic Plan (2024–2027) to enhance educational quality, infrastructure, and teacher capacity, the plan does not explicitly incorporate structured peer-based pedagogies to foster student motivation (gombesubeb.org.ng).

Gender disparities in education in Gombe also remain a concern. Analysts have noted that the absence of a gender-responsive education sector plan contributes to unequal retention and participation rates, especially in the sciences (The Cable, 2024). Whether peer tutoring can serve as a gender-equitable intervention in physics, promoting participation and achievement across male and female students, remains underexplored.

Therefore, the central problem is that while Gombe State is making policy-level efforts to improve educational quality, there is a lack of empirical evidence on the effectiveness of peer tutoring in enhancing achievement motivation in physics, and whether such benefits are equitable across gender. Without this evidence, policymakers, curriculum planners, and school leaders cannot confidently adopt or scale peer tutoring as a strategy to address low engagement, motivation, and performance in physics classrooms.

Objectives of the Study

The objectives of this study is to determine the effect of peer tutoring instructional strategy on academic performance and achievement motivation of senior secondary school students in physics in Gombe State, Nigeria. Specifically, the study aims to:

1. determine the effect of peer tutoring teaching strategy on students' achievement motivation in physics.
2. determine the effect of peer tutoring on male and female students' achievement motivation in physics.
3. determine the interaction effect of teaching strategies and gender on students' academic achievement motivation.

Research Questions

The following research questions were answered:

1. What are the pre-test and post-test levels of motivation responses of students taught with peer tutoring teaching strategy and conventional teaching method?
2. What are the pretest and post-test levels of motivation responses of male and female students taught with peer tutoring?

Hypotheses

Based on the purpose, the following null hypotheses are formulated and tested at 0.05 level of significance:

H₀₁: There is no significant difference in the scale of achievement motivation scores of students taught with peer tutoring teaching strategy and those exposed to conventional teaching method.

H₀₂: There is no significant difference in the level of achievement motivation of male and female students taught with peer tutoring teaching strategy.

H₀₃: There is no significant interaction effect of teaching methods and gender on achievement motivation of physics students.

Methodology

This study adopted a quasi-experimental research design. Specifically, the pre-test, post-test, non-equivalent control group design was used. The population of the study consisted of 4,727 SS II students offering Physics in public senior secondary schools across the 11 local government areas and three education zones of Gombe state during the 2023/2024 academic session. A sample of 204 SS II Physics students was selected through simple random sampling techniques. The sample comprised four intact classes drawn from four co-educational public senior secondary schools. Two schools (99 students) were assigned to the treatment group, while the remaining two schools (105 students) served as the control group.

The instrument for data collection was the Academic Achievement Motivation Questionnaire (AAMQ) adapted from Savarimuthu and Rajagopalan (2014). The AAMQ consisted of two

sections: Section A elicited personal information of the respondents, while Section B comprised 38 achievement motivation items structured on a five-point Likert scale of Strongly Agree (5), Agree (4), Undecided (3), Disagree (2), and Strongly Disagree (1).

The instrument was validated by three experts, including two educational psychology experts and one physics educator. In addition, one expert of Measurement and Evaluation assessed the instrument for construct, content, and face validity. A trial testing of the AAMQ was conducted, and a reliability coefficient of 0.80 was obtained using Cronbach’s alpha, which was considered acceptable. Data collection took place over a period of six weeks with the assistance of the Physics teachers of the selected schools. In the first week, an introductory letter was obtained from the Department of Physical Sciences Education, Modibbo Adama University, Yola, introducing the researchers to the authorities of the selected schools. Thereafter, copies of the questionnaire were given to research assistants who were instructed to ensure that students completed the instruments independently. In the second week, the research assistants administered the AAMQ during Physics lessons, provided clarifications as necessary, and ensured that all administered copies were retrieved.

Mean and standard deviation were used to answer the research questions, while the general linear model (Univariate) was used to perform the Analysis of Covariance (ANCOVA) for testing all hypotheses at .05 level of significance. Since intact classes participated in the experiment, ANCOVA was deemed appropriate to control for pre-test differences. If the p-value obtained was less than .05, the null hypothesis was rejected; otherwise, the null hypothesis was retained.

Results

Research Question 1: What are the pre-test and post-test levels of motivation responses of students taught with peer tutoring teaching strategy and conventional teaching method?

Table 1: Mean and Standard Deviation of Achievement Motivation of Students before and After the Treatment

Group	n	Pre achievement motivation		Post achievement motivation		Mean difference
		Mean	S.D	Mean	S.D	
Experimental Group	99	2.76	.87	3.95	.54	0.11
Control Group	105	2.94	.82	3.84	.57	

Table 1 displays the mean and standard deviation of students' level of achievement motivation before and after the treatment. The experimental group had a pre-treatment achievement motivation mean score of 2.76 (SD = 0.87), which increased to 3.95 (SD = 0.54) after the intervention. The control group started with a slightly higher pre-treatment mean of 2.94 (SD = 0.82) and improved to 3.84 (SD = 0.57). The mean difference between the two groups' post-achievement motivation scores is 0.11, showing a slight increase in motivation for students taught using peer tutoring compared to those taught with conventional methods.

Research Question 2: What are the pretest and post-test levels of motivation responses of male and female students taught with peer tutoring?

Table 2: Mean and Standard Deviation of Achievement Motivation Scores of Male and Female Students in the Experimental Group

Gender	N	Pre achievement motivation		Post achievement motivation		Mean difference
		Mean	S.D	Mean	S.D	
Male	39	2.72	.74	3.99	.40	0.07
Female	60	2.79	.95	3.92	.62	

Table 2 presents the achievement motivation scores of male and female students in the experimental group before and after the treatment. Male students had a pre-achievement motivation mean score of 2.72 (SD = 0.74), which increased to 3.99 (SD = 0.40) after the intervention. Female students had a slightly higher pre-treatment mean score of 2.79 (SD = 0.95) and a post-treatment mean score of 3.92 (SD = 0.62). The mean difference between the post-achievement motivation scores of male and female students is 0.07, showing a minimal difference in motivation levels between the two genders after the peer tutoring intervention. Both male and female students experienced an increase in achievement motivation, with male students having a slightly higher post-motivation score.

H₀₁: There is no significant difference in the scale of achievement motivation scores of students taught with peer tutoring teaching strategy and those exposed to conventional teaching method.

Table 3: Summary of ANCOVA of Difference in the Scale of Achievement Motivation of Students in the Experimental and Control Groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.644 ^a	2	.322	1.024	.361	.010
Intercept	257.317	1	257.317	818.728	.000	.803
Pre achievement motivation	.102	1	.102	.324	.570	.002
Teaching method	.487	1	.487	1.548	.215	.008
Error	63.172	201	.314			
Total	3153.790	204				
Corrected Total	63.816	203				

a. R Squared = .010 (Adjusted R Squared = .000)

The ANCOVA results in table 3 show no significant difference in the scale of achievement motivation scores between students taught with peer tutoring and those exposed to conventional teaching method. The F-value for teaching methods is 1.548, with a p-value of 0.215, which is greater than the 0.05 threshold for statistical significance. Therefore, the null hypothesis (H₀₁) is not rejected, indicating that the teaching method does not have a significant effect on achievement motivation. The partial eta squared value of 0.008 indicates a very small effect size, further suggesting that the teaching method has minimal impact on motivation.

H₀₂: There is no significant difference in the level of achievement motivation of male and female students taught with peer tutoring teaching strategy.

Table 4: Summary of ANCOVA of Difference in the Scale of Achievement Motivation Scores of Male and Female Students in the Experimental Groups

Source	Type III Sum of Squares	Sumdf	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	.415 ^a	2	.208	.696	.501	.014	
Intercept	151.393	1	151.393	506.971	.000	.841	
Pre – motivation	.293	1	.293	.982	.324	.010	
Gender	.107	1	.107	.358	.551	.004	
Error	28.668	96	.299				
Total	1569.804	99					
Corrected Total	29.083	98					

a. R Squared = .014 (Adjusted R Squared = -.006)

Table 4 presents the ANCOVA results for achievement motivation scores based on gender. The F-value for gender is 0.358, with a p-value of 0.551, which is greater than the significance level of 0.05. This means that gender does not have a significant effect on the achievement motivation of students taught with the peer tutoring strategy. As a result, the null hypothesis (H₀₂) is not rejected. The partial eta squared value of 0.004 indicates an extremely small effect size, confirming that gender does not significantly influence achievement motivation.

H₀₃: There is no significant interaction effect of teaching methods and gender on achievement motivation of physics students.

Table 5: Summary of ANCOVA of Interaction Effect of Teaching Methods and Gender on Achievement Motivation of Physics Students

Source	Type III Sum of Squares	SumDf	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	1.902 ^a	4	.475	1.528	.195	.030	
Intercept	245.250	1	245.250	788.271	.000	.798	
Pre achievement motivation	.026	1	.026	.083	.773	.000	
Teaching methods	.761	1	.761	2.445	.119	.012	
Gender	.248	1	.248	.798	.373	.004	
Teaching methods * Gender	.979	1	.979	3.147	.078	.016	
Error	61.914	199	.311				
Total	3153.790	204					
Corrected Total	63.816	203					

a. R Squared = .030 (Adjusted R Squared = .010)

The results in table 5 show the ANCOVA analysis for the interaction effect of teaching methods and gender on achievement motivation. The interaction term of teaching methods * gender has an F-value of 3.147 df (1.203), with a p-value of 0.078, which is marginally higher than the 0.05 significance level. While this result suggests a potential interaction effect, it is not statistically significant at the conventional 0.05 level, leading to the retention of the null hypothesis (H₀₃). The partial eta squared value of 0.016 indicates a small effect size, suggesting that while there may be some effect of the interaction between teaching methods and gender on achievement motivation, it is not strong enough to be statistically significant at the 0.05 threshold.

Discussion of Findings

The finding of the study revealed that there is no significant difference in the level of motivation of students taught with peer tutoring teaching strategy and those exposed to conventional teaching method. This indicates that while peer tutoring enhances academic performance, it does not necessarily influence students' achievement motivation to learn. This finding, which indicates no significant difference in students' motivation between those taught with peer tutoring and those exposed to conventional teaching methods, contradicts multiple previous studies. John and Peter (2020), Olu and Adedayo (2018), and Nwachukwu and Okafor (2019) all found that peer tutoring significantly improved students' motivation. Furthermore, these studies consistently reported that female students exhibited higher levels of motivation compared to their male counterparts. Wasiu and Taiwo (2017) attributed the increased motivation of female students in peer tutoring to their stronger peer networks. The discrepancy between the present study's finding and prior research may be due to variations in how motivation was measured, differences in study populations, or the way peer tutoring was implemented. Nonetheless, the majority of previous studies suggest that peer tutoring generally enhanced student motivation, making the current finding an area for further investigation.

The finding of the study also revealed that there is no significant difference in the level of motivation scores of male and female students taught with peer tutoring teaching strategy. This finding suggests that gender does not play a significant role in determining students' motivation levels when taught using peer tutoring. Both male and female students exhibited similar levels of achievement motivation, indicating that the teaching strategy does not favour one gender over the other in terms of enthusiasm for learning. The finding of the study contradicts several previous studies. John and Peter (2020), Olu and Adedayo (2018), Nwachukwu and Okafor (2019), and Wasiu and Taiwo (2017) all found that female students exhibited higher motivation levels in peer-tutored groups compared to their male counterparts. These studies attribute the higher motivation levels in female students to factors like stronger peer networks and increased engagements in collaborative learning. Additionally, Aniebue and Ozoemena (2021) also observed that female students exhibited higher motivation, suggesting a consistent pattern across various studies.

The difference in the findings of the current study could be attributed to several factors. First, it is possible that the sample in the current study, which focused on physics students, may have exhibited different gender dynamics than the samples in the previous studies, which were likely more diverse across subject areas. Physics is often perceived as a more challenging subject, and this perception may have influenced male and female students' engagement with peer tutoring differently. Additionally, the lack of significant difference in motivation could also be due to the specific implementation of the peer tutoring strategy in the current study, which may not have been as structured or effective in fostering engagement among female students as in the previous studies.

Lastly, the finding of the study revealed that there is no significant interaction effect of teaching methods and gender on motivation of physics students. Similar to academic achievement, the study finds no significant interaction effect between teaching methods and gender on

motivation. This suggests that neither gender nor the type of teaching method significantly alters students' motivation levels. The finding reinforces the notion that motivation is a complex psychological factor influenced by personal, social, and environmental factors rather than by gender or specific teaching strategies alone. Lastly, the finding that there is no significant interaction effect of teaching methods and gender on motivation of physics students also conflicts with earlier studies. For instance, Wasiu and Taiwo (2017) found that female students exhibited greater motivation following peer tutoring, particularly in gender-segregated classrooms. Similarly, John and Peter (2020) and Nwachukwu and Okafor (2019) recorded higher motivation in female students within peer tutoring environments. The current study's finding suggests that gender does not interact with teaching method to influence motivation in physics, which challenges the consistent trend observed in other research. This calls for further investigation.

Conclusion

Based on the findings of this study, it is concluded that the use of peer tutoring as an instructional strategy does not significantly influence students' motivation in Physics when compared with the conventional teaching method. Both groups demonstrated similar levels of motivation, indicating that peer tutoring did not provide a motivational advantage over traditional instruction within the context of this study. The study further concludes that gender does not play a significant role in determining students' motivation when exposed to peer tutoring. Male and female students exhibited comparable motivation levels, suggesting that peer tutoring is equally suitable for learners of both genders. Finally, the absence of a significant interaction effect between teaching method and gender implies that the influence of peer tutoring on motivation is consistent across genders. This indicates that the strategy does not differentially benefit male or female students in terms of motivational outcomes.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Teachers should consider combining peer tutoring with additional motivational strategies such as goal setting, positive feedback, and real-life applications to strengthen students' engagement and interest in Physics.
2. Educators are encouraged to apply the strategy inclusively, ensuring equal participation opportunities for all students regardless of gender, while providing support tailored to individual learning needs.
3. Curriculum planners and teachers should focus on implementing evidence-based instructional approaches that benefit all learners uniformly, without the need for gender-specific modifications in motivation-related practices.

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