International Journal of Educational Studies (INJEDS)
Vol. 2 Is. 1 (June 2025)
EISSN: 3092-8990 (print)
Website: https://www.injeds.com

Effects of Reciprocal Peer- Tutoring Strategy on Students Interest in Senior Secondary School Physics in Abia State.

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Abstract

This study utilized a quasi-experimental design to explore the impact of reciprocal peer tutoring on students' interest in secondary school physics in Umuahia North, Abia State. A total of 103 SS2 physics students from four intact classes participated, including 53 students (36 males and 17 females) assigned to a control group and 50 students (32 males and 18 females) in the reciprocal peer tutoring group. The research was guided by two questions and two null hypotheses, tested at a 0.05 significance level. Data was collected using the Measure of Physics Students' Interest Scale (MPSIS), developed by the researcher and validated by subject experts. The reliability of the scale was confirmed through a test-retest method, yielding a coefficient of 0.82. Mean and standard deviation were used to address the research questions, while Analysis of Covariance (ANCOVA) tested the hypotheses at the 0.05 significance level. Findings revealed that students taught physics using reciprocal peer tutoring had higher mean interest scores compared to those taught via traditional lectures. Additionally, male students demonstrated greater mean interest scores than female students under the reciprocal tutoring method. There were significant differences in interest scores between the two teaching methods and between male and female students. The study recommends incorporating reciprocal peer tutoring into the physics curriculum to enhance student interest.

Keywords: Physics, Reciprocal Peer Tutoring, Interest, Student Interest in Physics, Academic Achievement in Physics.

Introduction

Education at all levels contributes to gaining respect in society, securing good jobs, and improving financial status (Ojukwu, 2016). For nations to effectively drive human and national development, a robust education sector is essential. A productive education system can be a powerful tool for alleviating poverty, creating jobs, and preventing crises. To foster sustainable human and socio-economic development in Nigeria, the education system adopted the 9-3-4

framework in 2006, which includes nine years of basic education up to Junior Secondary School, three years in Senior Secondary School, and four years in tertiary institutions (Uwaifo and Uddin, 2009). These educational levels significantly contribute to human and socio-economic development, with secondary education playing a crucial role in national development and workforce training. At the Senior Secondary School level, students study various subjects categorized into Sciences, Arts, Vocational, Social Sciences, and Commercial (Nlebem, 2011).

Physics, a key science subject in Nigerian secondary schools, addresses fundamental questions about matter and the interactions of nature's elementary components (Oluwasegun, Ohwofosirai & Emagbetere, 2015). Derived from the Latin word "Physica," meaning natural things, physics involves the study of matter and energy across various fields (Okoro, 2018). A solid foundation in physics is vital for pursuing physical sciences and engineering courses. The objectives of the physics curriculum include generating interest in the subject and developing essential technological skills (Eze & Ugwuanyi, 2013).

Student interest in a subject is closely linked to academic achievement. Interest, described as a preference for certain activities, motivates students to perform well academically (Tella, Adika & Toyoba, 2008). Research indicates that interest precedes achievement; thus, cultivating interest can enhance academic performance (Goolsby, 2013).

Unfortunately, academic performance in physics in Abia State has been disappointing, as reflected in the West African Senior Secondary School Certificate Examination results. For instance, in 2013, only 41.7% of students achieved A1-C6 in WASSCE, and this figure fluctuated in subsequent years (Abia State Secondary Education Management Board, 2018).
Physics is often perceived as a challenging subject, contributing to declining student interest. Factors influencing this trend include inadequate learning environments, ineffective teaching methods, and poor time management. Njoku, Nwagbo, and Ugwuanyi (2020) suggest that students' academic struggles in physics may be linked to the lack of verbal reinforcement strategies by teachers. Therefore, it is essential to implement instructional strategies that engage students, such as peer tutoring.

Peer tutoring involves students teaching each other, fostering collaboration and learning through structured partnerships (Adekoya & Olatoye, 2011). There are various types of peer

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tutoring, but the two most commonly used are class-wide peer tutoring and reciprocal peer tutoring (Horvath, 2011). In class-wide peer tutoring, all students are organized into groups, allowing them to receive one-on-one assistance. In contrast, reciprocal peer tutoring involves students alternating roles within their groups. The focus of this study is on Reciprocal Peer Tutoring (RPT), where students work in pairs or small groups, promoting mutual learning and support. This method can help address the lack of interest in physics and improve academic outcomes.

The declining interest in learning Physics, which has led to poor academic performance, may be linked to the teaching methods employed by Physics instructors. Thus, it is essential to explore the impact of the Reciprocal Peer Tutoring strategy on students' interest in Physics.

This study aims to investigate the effect of the Reciprocal Peer Tutoring strategy on secondary school students' interest in physics and explore how gender influences this effect.

Research Questions

The study was guided by the following research questions:

1. What are the mean interest scores of secondary school students in physics when taught using peer tutoring compared to the lecture method?
2. What are the mean interest scores of male and female secondary school students in physics when taught using the peer tutoring strategy?

Hypotheses

The following null hypotheses were tested at a 0.05 significance level:

HO1: There is no significant difference in the mean interest scores of students taught physics using the reciprocal peer tutoring strategy compared to those taught via the lecture method.

HO2: There is no significant difference in the mean interest scores of male and female students taught physics using the reciprocal peer tutoring strategy.

Method

The study employed a pretest-posttest quasi-experimental design to examine the impact of a reciprocal peer tutoring strategy on students' interest in secondary school physics in Umuahia North Local Government Area of Abia State. A total of 103 SS2 physics students from four

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intact classes participated, with 53 students (36 males and 17 females) randomly assigned to the control group and 50 students (32 males and 18 females) assigned to the reciprocal peer tutoring group. The research was guided by two research questions and two null hypotheses, tested at a significance level of 0.05. Data collection utilized the Measure of Physics Students' Interest Scale (MPSIS), developed by the researcher and validated for face and content by subject matter experts. The instrument's reliability was confirmed through a test-retest method, yielding a reliability coefficient of 0.82. Mean and standard deviation were used to address the research questions, while Analysis of Covariance (ANCOVA) was employed to test the hypotheses at the 0.05 significance level.

Results

Research Question 1: What are the mean interest scores of secondary school students in physics when taught using reciprocal peer tutoring strategy and lecture method?

Table 1: Mean and standard deviation interest scores of students taught physics using reciprocal peer tutoring strategy and lecture method

Variable		Pretest		Posttest		Mean Interest
Learning Strategies	**N**	**$\bar{X}$**	**SD**	**$\bar{X}$**	**SD**	**Gain**
Reciprocal Peer Tutoring	50	39.02	4.78	52.65	5.34	13.63
Lecture Method	53	39.01	4.65	43.37	4.82	4.36

Where N= Number of respondents, $\bar{X}$= mean, SD= Standard deviation

Table 1 showed that students taught physics using reciprocal peer-tutoring strategy had an interest pre-test mean score of 39.02 with a standard deviation of 4.78 and an interest post-test mean of 52.65 with a standard deviation of 5.34. The difference between the pre-test and post-test interest mean for the peer-tutoring group was 13.63. For students taught with lecture method, their interest pre-test mean score is 39.01 with a standard deviation of 4.65 and post-test mean score is 43.37 with a standard deviation of 4.82 which results to a mean gain of 4.36. However, for each of the groups, the post-test interest mean scores were greater than the pre-test interest mean scores with the students taught physics using reciprocal peer-tutoring strategy having a higher interest mean gain. This result shows that reciprocal peer-tutoring strategy increase students' interest more than lecture method. This also means that learning strategy may have some effects on students' interest in physics.

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Hypothesis 1:

There is no significant difference in the mean interest scores of students taught physics using reciprocal peer-tutoring strategy and lecture method.

Table 2: Analysis of covariance (ANCOVA) of students' interest in Physics when taught using reciprocal peer-tutoring strategy and lecture method

Source	Type 111 Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4223.851[a]	3	1407.950	43.651	.000
Intercept	5626.527	1	5626.527	174.440	.000
PRE-TEST	722.855	1	722.855	22.411	.000
Strategies*	3471.680	2	1735.840	53.816	.000
Error	7612.133	100	32.255		
TOTAL	564988.000	103			
Corrected Total	11835.983	102			

a. R Squared = .357 (Adjusted R Squared = .349)

The result in Table 2 shows that with respect to the interest mean scores of students taught physics using reciprocal peer tutoring strategy and lecture method, an F-ratio of 53.816 was obtained with associated exact probability value of .000. Since the associated probability (.000) was less than 0.05 set as level of significance, the null hypothesis (H_{01}) which stated that there is no significant difference in the mean interest score of students taught physics using reciprocal peer tutoring strategy and lecture method is rejected. Thus, inference drawn is that there was a significant difference in the mean interest score of students taught physics using reciprocal peer tutoring strategy and lecture method with those taught with reciprocal peer tutoring having a higher interest mean gain.

Research Question 2: What are the mean interest scores of the secondary school male and female students in physics when taught using peer tutoring strategy?

Table 3: Mean and standard deviation of interest scores of male and female students taught physics using reciprocal peer tutoring strategy.

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Learning Strategies	Gender		Pre-test		Post-test		Interest Mean Gain
	N	X	SD	X	SD		
Reciprocal peer tutoring	Male	32	38.76	5.09	55.26	5.15	16.5
	Female	18	39.23	5.15	50.55	4.54	11.32

Where N= Number of respondents, $\overline{X}$= mean, SD= Standard deviation

Table 3 showed that male students taught physics using reciprocal peer tutoring strategy had pre-test interest mean score of 38.76 with standard deviation of 5.09 and post- test interest mean score of 55.26 with standard deviation of 5.15 giving an interest mean gain of 16.5. The female students taught physics with reciprocal peer tutoring had pre-test and post-test mean scores of 39.23 and 50.55 respectively with standard deviation of 5.15 and 4.54 respectively giving an interest mean gain of 11.32. This shows that the male students taught physics using reciprocal peer tutoring strategy seem to have higher interest than their female counterparts taught using the same strategy. This result shows that gender seem to have some effects on students' interest in physics when taught using reciprocal peer tutoring strategy.

Hypotheses 2: There is no significant difference in the mean interest scores of male and female students taught physics using reciprocal peer tutoring

Table 4: Analysis of covariance of male and female students' interest means scores in physics when taught using reciprocal peer tutoring

Source	Type 111 Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	502.157[a]	2	251.078	10.853	.000
Intercept	4210.973	1	4210.973	182.029	.000
PRE-TEST	36.036	1	36.036	1.558	.216
GENDER	425.324	1	452.324	19.553	.000
Error	1896.949	47	23.134		
TOTAL	238100.00	50			
Corrected Total	2399.106	49			

a. R Squared = .209 (Adjusted R Squared = .190)

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The result in Table 4 shows that with respect to the interest mean scores of male and female students taught physics using reciprocal peer tutoring, an F-ratio of 19.553 was obtained with associated exact probability value of .000, since the associated probability (.000) was less than 0.05 set as level of significance, the null hypothesis (H_{02}) which stated that there is no significant difference in the mean interest score of male and female students taught physics using reciprocal peer tutoring was rejected. Thus, inference drawn is that there was a significant difference in the mean interest score of male and female students taught physics using reciprocal peer tutoring strategy. This indicated that gender is a significant factor affecting students' interest toward physics when taught using reciprocal peer tutoring strategy.

Discussion

The results in Table 1 indicate that the reciprocal peer tutoring strategy enhances students' interest more effectively than the lecture method. This also means that learning strategy may have some effects on students' interest in physics. The hypothesis presented in Table 2 reveals that regarding the mean interest scores of students taught physics through reciprocal peer tutoring compared to those taught via lecture method, an F-ratio of 53.816 was found, with an associated probability value of .000. Since this probability value (.000) is less than the significance level of 0.05, the null hypothesis (H01), which posited that there is no significant difference in the mean interest scores between the two teaching methods, is rejected. This indicates a significant difference in mean interest scores, with students taught using reciprocal peer tutoring showing a higher mean gain in interest. Thus, the reciprocal peer tutoring strategy has proven to enhance students' interest in physics more than the lecture method. This finding aligns with Uroko's (2010) research, which noted that reciprocal peer tutoring significantly improved the reading comprehension interest of senior secondary school students. Supporting this finding, Akay (2011), indicated that peer instruction method has significant positive effects on students' achievement and attitude towards mathematics. These finding could be attributed to the fact that reciprocal peer tutoring strategy uses shills such as predicting, clarifying, questioning and summarizing, which potentially help students to understand what they read which could as well enhance their interest to the study of physics.

The results in Table 3 indicate that male students taught physics using the reciprocal peer tutoring strategy appear to have a higher interest in the subject than their female peers taught with the same approach. Confirmatory findings in Table 4 reveal that, regarding the mean

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interest scores of male and female students taught physics through reciprocal peer tutoring, an F-ratio of 19.553 was obtained, accompanied by a probability value of .000. Since this probability value (.000) is less than the significance level of 0.05, the null hypothesis (H03), which asserted that there is no significant difference in mean interest scores between male and female students taught using this strategy, is rejected. This suggests that gender plays a significant role in influencing students' interest in physics when taught through reciprocal peer tutoring. This finding is contrary to the findings of Uroko (2010) who stated that significant difference does not exist on the student's interest and self-efficacy in reading comprehension of students based on the reciprocal peer tutoring strategy. On the other hand findings of Okoro (2018) reported that gender directly influence reading interest. Okoro (2018) was quick to point out however, that closer scrutiny of those instances where boys displayed a greater interest in reading than girls revealed that the reading interest was not characterized by the volume of the material to read, but rather on the type of materials read. In the present study interest of male and female students differ significantly with the male students having higher interest than the female.

Conclusion

A significant difference was found in the mean interest scores of students taught physics using the reciprocal peer tutoring strategy compared to those taught via the lecture method, with the reciprocal peer tutoring group showing higher mean interest gains. Additionally, there was a notable difference in the mean interest scores between male and female students taught physics through reciprocal peer tutoring, with male students demonstrating higher mean interest gains than their female counterparts. This implies that gender is a significant factor influencing students' interest in physics when taught using reciprocal peer tutoring.

Recommendations

In light of the study's findings, the following recommendations are proposed .

1. Physics teachers should be taught how to utilize the peer tutoring learning strategy in the teaching and learning process of Physics since it has been found to improve and enhance the interest of students in Physics.
2. The reciprocal peer tutoring strategy should be integrated into the physics curriculum to complement current teaching methods, thereby enhancing students' interest and ultimately improving their academic performance in physics.

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