

Effect of Peer Tutoring Strategy on Upper Basic II Students' Achievement and Retention in Basic Science and Technology in Otukpo LGA, Benue State.

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ABSTRACT

The study examined the Effect of Peer Tutoring Strategy on Upper Basic II Students' achievement in Basic Science and Technology in Otukpo LGA, Benue State. Two research questions were asked and answered and two hypotheses were tested at 0.05 level of significance. A pre-test post-test quasi-experimental research design was adopted for the study. Simple random sampling techniques were used to sample 85 (44 Male and 41 Female) students in two intact classes from the population of 4,834 upper basic II students. Basic Science and Technology Achievement Test (BSTAT) and Basic Science and Technology Retention Test (BSTRT), instruments were used for data collection. A reliability coefficient of 0.79 was obtained using kuder-Richardson 20 formula. Data were analyzed using mean and standard deviation, to answer research questions while the null hypotheses were tested using analysis of Covariance (ANCOVA). Findings of the study showed that there is a statistically significant difference between the mean achievement scores of students taught Basic Science and Technology with peer tutoring instructional strategy and those taught with lecture method, among others. Based on the findings, it was concluded that appropriate use of peer tutoring instructional strategy in teaching Basic Science and Technology would enhance students' achievement and retention in Basic Science and Technology, in Otukpo LGA. Therefore, it was recommended that Basic Science and Technology teachers should endeavor to incorporate peer tutoring strategy into the teaching of Basic Science and Technology so as to increase achievement and retention in the subject.

Keywords: Peer Tutoring, Achievement, Retention, Basic Science and Technology and Upper Basic II Students.

INTRODUCTION

Education remains a critical tool for national development, and at the heart of educational achievement is the academic performance of students. In Nigeria, the Universal Basic Education (UBE) programme emphasizes the importance of quality education at the basic level, including the teaching and learning of Basic Science and Technology (BST), a core subject that introduces learners to scientific inquiry, innovation, and technological advancement. Basic Science and Technology is a subject that demands practical engagement, critical thinking, and curiosity, the impact of peer influence becomes particularly significant. Students who associate with academically driven peers are more likely to develop interest and competence in BST, while those who align with unserious or anti-school groups may develop negative attitudes towards science learning. However, numerous factors affect students' interest and academic achievement in BST, among which peer group pressure stands out, particularly at the Upper Basic 2 level, a developmental stage characterized by a strong desire for social acceptance.

The importance of Basic science has been seen in different aspects of society. Adegoke (2015) noted that by introducing Basic science curriculum to students in secondary schools, society and the students could benefit in several ways namely: reducing poverty in the society; developing creative skills for the students; improving the health status of the students and those around them; improving the living conditions of their parents in the long run; and empowering students to convert natural physical objects in their environment for wealth creation. On another note, Agbidye (2015) stated that Basic science functions as the basis upon which some required training in scientific skills is provided in order to meet the growing needs of the society and attain good academic achievement in science.

The term academic achievement according to Nwankwo and Okoli (2019), refers to the performance outcomes in intellectual domains taught at school, college, and university. Academic achievement is the extent to which an individual or institution has attained short- or long-term educational goal. It is a term usually employed to describe an individual 's performance in subjects taught and tested in schools (Mkpae, & Obowu-Adutchay, 2017). In the views of Ezugwu, Nwani, Agbo and Mbonu-Adigwe, (2019), academic achievement typifies the knowledge attained and skills developed in a school subject, usually designated by test scores. It can be measured in two different ways: grades and educational degrees and then by standardized achievement tests. While grades and educational degrees are measured by grade point average (GPA), which is the arithmetic mean of all grades that have been received during a certain time, standardized achievement tests are administered under controlled (or "standardized") conditions, specifying where, when, how, and for how long test-takers may respond to questions. The outcome of such test scores provides a way to gather, describe, and quantify information that assesses performance. Thus, academic achievement in the present study is understood as students' scores attained in standardized tests administered in upper basic school in Benue State, which describes their learning of the subject matter content of Basic science and Technology. Usman in Ogbonna and Kalu-Uche (2021), stated that Students' academic achievement is directly related to the quality of teaching received, which invariably impacts on learners' retention.

The goal of teaching and learning is to achieve retention. Retention is the ability to store, keep or continue having learned material in the long-term memory, and to retrieve it when needed for a later task (Merriam-Webster, 2020). Retention occurs when facts and experiences are stored in the long-term memory (Kalu-Uche & Ogbonna, 2021). The retention of learned concepts helps in reflective thinking and thus, the use of the retained material in creative ways in solving day to day problems. Retention enables learners to perform efficiently and effectively in their academics as academic achievement is directly related to knowledge retention (Agaba, 2013). Researchers in science education posit that, instructional techniques which encourage students' active participation in the teaching/learning process, promotes the retention of learned materials in science (Chukwu in Kalu-Uche & Ogbonna, 2021). Aremu and Sokan in Nwankwo and Okolie (2019), argue that academic achievement and retention is not only determined by intellectual capacity but also by social and emotional support systems such as family background, teacher influence, and peer associations peer group as well as gender.

Gender is a category of sex, either male or female into which sexually-reproducing organisms are divided on the basis of their reproductive roles in their species. Gender imbalance is conceived as the structural relationship of inequality between males and females as manifested in education. Gender inequality in education has remained a perennial problem of global scope (UNESCO, 2021). Jirgba *et.al.* (2018) stated that in Nigeria, as in other countries of the world Science and Technology are usually viewed as male dominant subjects. Girls opt for careers in humanities and social science related careers. Gender differences in science interest and achievement have been a major concern and science educators seek to provide avenues for achieving gender equity for sustainable development. The performance in the science at both upper basic and senior secondary

school levels of education vary across gender. It appears that female students are more interested in the non-science subjects more than the science subjects in which basic science and technology is inclusive at the upper basic education levels and senior secondary school classes (Okeke in Jirgba *et.al.* 2019). Fadare, *et. al.*, (2021), states that peer group tutoring also influences the development of children socializing skills. They learn from a

peer how to cooperate and socialize according to group norms and group-sanctioned modes of behaviour. Wael in Tartenger *et. al.*, (2024) suggested the used of peer-tutoring strategy.

Peer-tutoring strategy is a cooperative teaching and learning procedure that requires active participation of the learners. It is an instructional strategy where students help one another learn academic content, typically with one student acting as the tutor and the other as the learner. This approach encourages cooperative learning by allowing students to take an active role in teaching and learning processes. According to Tran in Tartenger *et. al.*, (2024) peer-tutoring method does not only increase the performance of students, but also promotes their communication abilities and interpersonal relationships.

Usually, shy children learn effectively through tutoring by sharing their thoughts with classmates (Bombardelli, 2016). Peer-tutoring is an active teaching methodology that fosters student inclusion while enabling students to learn from each other (Cockerill, Craig & Thurston, 2018). Research has shown that peer tutoring improves learning outcomes and fosters positive attitudes towards science subjects. Ovie (2022) stated that peer tutoring significantly improve students' performance and learning attitudes. Also, Azeez, *et. al.*, (2022) found that peer-tutoring instructional strategies have significant effect on students' interest and academic achievement. According to Akinbobola and Afolabi (2010) who opined that students taught through peer tutoring performed significantly better in science subjects compared to those taught using conventional methods.

Jegede and Adebayo (2013) emphasized that peer-led instructional strategies help to simplify complex science concepts, thereby enhancing student comprehension and interest. Igbokwe (2015) emphasized that poor academic achievement in science subjects could be traced to environmental and social factors, including the influence of unmotivated or deviant peer groups. These challenges necessitate the adoption of innovative instructional strategies such as peer tutoring to complement the efforts of teachers and improve learning outcomes.

Despite the growing advocacy for learner-centered approaches in science education, there remains a paucity of empirical studies specifically addressing how peer tutoring strategy effect Upper Basic 2 Students' achievement in Basic Science and Technology in Otukpo LGA, Benue State. This study, therefore, seeks to explore the Effect of Peer Tutoring strategy on Upper Basic 2 Students' achievement in Basic Science and Technology in Otukpo LGA, Benue State.

Objective of the Study

The main objective of this study is to investigate the Effect of Peer tutoring strategy on Upper Basic 2 Students' achievement in Basic Science and Technology in Otukpo LGA, Benue State.

Specifically, the study sought to:

1. Determine the difference in the mean achievement scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method;
2. Determine the difference in the mean achievement scores of male and female students taught Basic Science and Technology with peer tutoring strategy;
3. Determine the difference in the mean retention scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method;
4. Determine the difference in the mean retention scores of male and female students taught Basic Science and Technology with peer tutoring strategy;

Research Questions

The following research questions were asked and answered by the study.

1. What is the difference in the mean achievement scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method?
2. What is the difference in the mean achievement scores of male and female students taught Basic Science and Technology with peer tutoring strategy?
3. What is the difference in the mean retention scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method?
4. What is the difference in the mean retention scores of male and female students taught Basic Science and Technology with peer tutoring strategy?

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance.

1. There is no significance difference in the mean achievement scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method.
2. There is no significance difference in the mean achievement scores of male and female students taught Basic Science and Technology with peer tutoring strategy.
3. There is no significance difference in the mean retention scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method.
4. There is no significance difference in the mean retention scores of male and female students taught Basic Science and Technology with peer tutoring strategy.

METHODOLOGY

The researcher adopted a quasi-experimental research design. The study was carried out in Otukpo Local Government Area (LGA), Benue State. The population of the study consisted of 4,834 upper basic two students in all Basic Education Schools in Otukpo Local Government Area.

The sample size for the study was 85 (44 male and 41 female) Upper Basic II (JSS 2) students in co-educational public Schools. The sample was drawn from 2 intact classes using a simple random sampling technique. The instruments used for data collection was Basic Science and Technology Achievement Test (BSTAT) and Basic Science and Technology Retention Test (BSTRT).

The instruments consisted of 40 multiple choice items, with options A-D. The research instrument was validated by two experts. One from the Department of Integrated Science Education, Joseph Sarwuan Tarka University, Makurdi, and one Basic Science and Technology teacher. Their inputs and Suggestions helped in improving the quality of the instrument.

The reliability coefficient of BSTAT was determined using kuder-Richardson 20 formula and it was found to be 0.79. The Data was collected with the help of two research assistants from the sampled schools.

The research questions were answered using mean and standard deviation. While, Analysis of Covariance (ANCOVA) was used to test the null hypothesis at 0.05 level of significance.

Presentation of Results

Results are presented according to order of research questions and hypotheses:

Research Question 1

What is the difference in the mean achievement scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method?

Table 1: Mean and Standard Deviation of Achievement Scores of Students taught Basic Science and Technology with Peer Tutoring Strategy and those Taught with Conventional Lecture Method

Group	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Peer Tutoring Strategy	43	21.79	2.07	29.28	3.34	7.49
Lecture Method	42	21.81	2.09	25.07	2.85	3.26
Mean Difference		0.02		4.21		4.23
Total	85					

The results presented in Table 1, shows that the mean achievement scores of students taught Basic Science and Technology with peer tutoring strategy was 21.79 for pre-test and 29.28 for the post-test with corresponding standard deviation of 2.07 and 3.34 respectively.

However, the mean achievement scores of students taught Basic Science and Technology with the lecture method was 21.81 for the pre-test and 25.07 for the post-test, with standard deviation of 2.09 and 2.85 respectively. The mean gain for the peer tutoring strategy group was 7.49 while the lecture method group was 3.26. The group mean difference was 0.02 for pre-test and 4.21 for post-test while the mean gain was 4.23 in favor of the peer tutoring strategy group.

Research Question 2

What is the difference in the mean achievement scores of male and female students taught Basic Science and Technology with peer tutoring strategy?

Table 2: Mean and Standard Deviation of Achievement Scores of Male and Female Students taught Basic Science and Technology with Peer Tutoring Instructional Strategy.

Group	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Male	22	21.18	2.42	29.36	1.26	8.18
Female	21	22.43	1.40	30.62	2.73	8.19
Mean Difference		1.25		1.26		0.01
Total	43					

The results presented in Table 2, shows that the mean achievement scores of male students taught Basic Science and Technology with Peer Tutoring instructional strategy was 21.18 for pre-test and 29.36 for the post-test with corresponding standard deviation of 2.42 and 1.26 respectively.

However, the mean achievement scores of female students taught Basic Science and Technology with Peer Tutoring instructional strategy was 22.43 for the pre-test and 30.62 for the post-test, with corresponding standard deviation of 1.40 and 2.73 respectively. The mean gain for the male students was 8.18 while the female students was 8.19. The group mean difference was 1.25 for pre-test and 1.26 for post-test while the mean gain was 0.01 in favor of the female students.

Research Question 3

What is the difference in the mean retention scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method?

Table 3: Mean and Standard Deviation of Retention Scores of Students taught Basic Science and Technology with Peer Tutoring Strategy and those Taught with Conventional Lecture Method

Group	N	Post-test		Retention-test		Mean Gain
		Mean	SD	Mean	SD	
Peer Tutoring Strategy	43	29.28	3.34	30.52	2.40	1.24
Lecture Method	42	25.07	2.85	26.70	3.93	1.63
Mean Difference		4.21		3.82		0.39
Total	85					

The results presented in Table 3, shows that the mean retention scores of students taught Basic Science and Technology with Peer Tutoring instructional strategy was 29.28 for post-test and 30.52 for the retention test with corresponding standard deviation of 3.34 and 2.40 respectively. However, the mean retention scores of students taught Basic Science and Technology with the lecture method was 25.07 for the post test and 26.70 for the retention test, with standard deviation of 2.85 and 3.93 respectively. The mean gain for the Peer Tutoring instructional strategy was 1.24 while the lecture method group was 1.63. The group mean difference was 4.21 for post-test and 3.82 for retention test while the mean gain was 0.39 in favor of the lecture method group. However, both the peer tutoring and lecture method have their mean retention scores above the posttest mean score.

Research Question 4

What is the difference in the mean retention scores of male and female students taught Basic Science and Technology with peer tutoring strategy?

Table 4: Mean and Standard Deviation of Retention Scores of Male and Female Students taught Basic Science and Technology with Peer Tutoring Strategy.

Group	N	Post-BSTAT		Retention-BSTAT		Mean Gain
		Mean	SD	Mean	SD	
Male	22	28.13	3.40	29.83	2.39	1.70
Female	21	30.71	2.78	31.29	2.24	0.58
Mean Difference		2.58		1.46		1.12
Total	43					

The results presented in Table 4, shows that the mean retention scores of male students taught Basic Science and Technology peer tutoring strategy was 28.13 for post-test and 29.83 for the retention test with corresponding standard deviation of 3.40 and 2.39 respectively.

However, the mean retention scores of female students taught Basic Science and Technology using the peer tutoring strategy was 30.71 for the post-test and 31.29 for the retention-test, with corresponding standard deviation of 2.78 and 2.24 respectively. The mean gain for the male students was 1.70 while the female students was 0.58. The group mean difference was 2.58 for post-test and 1.46 for retention test while the mean gain was

1.12 in favor of the male students. However, both the male and female mean retention score was above the posttest mean score.

Hypothesis 1

There is no significance difference in the mean achievement scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with lecture method.

Table 5: Analysis of Covariance of Achievement Scores of Students taught Basic Science and Technology with Peer Tutoring Instructional Strategy and those Taught with Lecture Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	562.489 ^a	2	281.244	47.994	.000	.539
Intercept	277.009	1	277.009	47.271	.000	.366
Pretest	51.240	1	51.240	8.744	.004	.096
Group	512.725	1	512.725	87.495	.000	.516
Error	480.523	82	5.860			
Total	65572.000	85				
Corrected Total	1043.012	84				

R Squared = .539 (Adjusted R Squared = .528)

The result of the Analysis of Covariance presented in Table 5 shows that the P-value of 0.000 is less than .05 ($P < 0.05$) level of significance. This shows that the test was significant. The result implies that there is a statistically significant difference between the mean achievement scores of students taught Basic Science and Technology with peer tutoring instructional strategy and those taught using lecture method.

Therefore, the null hypothesis was rejected. This means that students who were exposed to peer tutoring instructional strategy achieved higher than those not exposed to peer tutoring instructional strategy.

Hypothesis 2

There is no significance difference in the mean achievement scores of male and female students taught Basic Science and Technology with peer tutoring strategy.

Table 6: Analysis of Covariance of Achievement Scores of Male and Female Students taught Basic Science and Technology Peer Tutoring Instructional Strategy.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	30.519 ^a	2	15.260	3.623	.036	.153
Intercept	190.112	1	190.112	45.142	.000	.530
Pretest	13.586	1	13.586	3.226	.080	.075
Gender	7.801	1	7.801	1.852	.181	.044
Error	168.457	40	4.211			

Total	38839.000	43				
Corrected Total	198.977	42				

R Squared = .153 (Adjusted R Squared = .111)

The result of the Analysis of Covariance presented in Table 4 shows that the P-value of 0.181 is greater than .05 ($P > 0.05$) level of significance. This shows that the test was not significant. The result implies that there is no statistically significant difference between the mean achievement scores of male and female students taught Basic Science and Technology with peer tutoring instructional strategy.

Therefore, the null hypothesis of no significance difference was not rejected. This means that both the male and female students achieve significantly higher when taught with peer tutoring instructional strategy.

Hypothesis 3

There is no significance difference in the mean retention scores of students taught Basic Science and Technology with peer tutoring strategy and those taught with conventional lecture method.

Table 7: Analysis of Covariance of Retention Scores of Students taught Basic Science and Technology with Peer Tutoring Instructional Strategy and those taught with Lecture Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1009.884 ^a	2	504.942	276.962	.000	.872
Intercept	59.107	1	59.107	32.420	.000	.286
Posttest	703.702	1	703.702	385.982	.000	.827
Group	71.761	1	71.761	39.361	.000	.327
Error	147.675	82	1.823			
Total	70359.000	85				
Corrected Total	1157.560	84				

R Squared = .872 (Adjusted R Squared = .869)

The result of the Analysis of Covariance presented in Table 7 shows that the P-value of 0.000 is less than .05 ($P < 0.05$) level of significance. This shows that the test was significant.

Therefore, the null hypothesis was rejected. The result implies that there is a statistically significant difference between the mean retention scores of students taught Basic Science and Technology with peer tutoring instructional strategy and those taught using the conventional lecture method.

This means that students who were exposed to peer tutoring instructional strategy retained more than those not exposed to multimedia instructional strategy.

Hypothesis 4

There is no significance difference in the mean retention scores of male and female students taught Basic Science and Technology with peer tutoring strategy.

Table 8: Analysis of Covariance of Retention Scores of Male and Female Students taught Basic Science and Technology with Peer Tutoring Strategy and those taught with Lecture Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	155.288 ^a	2	77.644	33.978	.000	.624
Intercept	89.579	1	89.579	39.201	.000	.489
posttest	131.901	1	131.901	57.722	.000	.585
Group	.001	1	.001	.000	.987	.000
Error	93.689	40	2.285			
Total	41241.000	43				
Corrected Total	248.977	42				

R Squared = .624 (Adjusted R Squared = .605)

The result of the Analysis of Covariance presented in Table 8 shows that the P-value of 0.987 is greater than .05 ($P > 0.05$) level of significance. This shows that the test was not significant. Therefore, the null hypothesis was not rejected. The result implies that there is no statistically significant difference between the mean retention score of male and female students taught Basic Science and Technology with peer tutoring strategy. This means that both male and female students exposed peer tutoring instructional strategy retained well.

DISCUSSION OF FINDINGS

The findings in research question one and hypothesis one revealed that, there is a statistically significant difference between the mean achievement scores of students taught Basic Science and Technology with peer tutoring instructional strategy and those taught with lecture method. This finding is supported by the finding of Ebute and Aende (2024), who found that the peer tutoring strategy had significant effect on students' achievement in Social Studies than the conventional strategy. The findings of the study are in line with the findings of Ogunsola, (2016), who found that peer tutoring strategy was more effective in improving students' cognitive achievement than the conventional teaching method. Also, the findings of the study is supported by the findings of Okeke *et.al.*, (2024), who found that students taught Economics in senior secondary schools with peer tutoring had better achievement than their counterparts taught using the lecture method. Moreover, the findings of the study are also supported by the findings of Iheahurukawa and Ugwu, (2024), and Tartenger *et.al.*, (2024), who found that students taught with peer tutoring strategy achieved more than students taught with lecture method, and there was a significant difference between students taught with peer tutoring and those taught with the lecture method.

The findings in hypothesis two revealed that there is no statistically significant difference between the mean achievement scores of male and female students taught Basic Science and Technology with peer tutoring instructional strategy. The findings of this study agree with the finding of Ogundola. (2016), who found no significant effects of gender on students' achievements in Technical Drawing when taught using peer tutoring strategy. Again, the findings of the study agree with the findings of Iheahurukawa and Ugwu, (2024), who found that there was no significant difference between the male and female students taught with peer tutoring instructional strategy. Moreover, the findings of the study is supported with the findings of Tartenger *et. al.*, (2024) who found that there is no significant difference in the mean academic performance scores of male and female students taught using peer tutoring strategy.

The finding from research question 3 and hypothesis three revealed that the students who were exposed to peer tutoring instructional strategy retained higher than the students not exposed to peer tutoring and there is a statistically significant difference between the mean retention scores of students taught Basic Science and Technology with peer tutoring instructional strategy and those taught using the conventional lecture method. This finding is in agreement with Essien (2016), who reported that Peer Tutoring was most effective in increasing students' academic performance and retention in Basic Science. Again, the finding is supported by the finding of Kalu-Uche and Ogbonna, (2021), who found that slow learners exposed to class-wide peer tutoring retained Biology concepts better than those exposed to the conventional teacher-led instructional strategy and also affirmed that there was a significant difference in the mean retention scores of slow learners taught Biology using class-wide peer tutoring and those taught using the conventional teacher-led instructional strategy with those taught using class-wide peer tutoring strategy having a higher mean gain.

The finding in research question 4 and hypothesis four that there is no statistically significant difference between the mean retention score of male and female students taught Basic Science and Technology with peer tutoring strategy. This finding is supported by the findings of Kalu-Uche and Ogbonna, (2021), who found no significant difference in the retention of both the male and female Biology students exposed to peer tutoring instructional strategies.

CONCLUSION

Based on the findings, it was concluded that using peer tutoring instructional strategy in teaching Basic Science and Technology would enhance students' achievement and retention in Basic Science and Technology, in Otukpo LGA. The strategy is gender friendly as both male and female students achieved relatively higher in Basic Science and Technology.

RECOMMENDATION

It was recommended that Basic Science and Technology teachers should endeavor to incorporate peer tutoring strategy into the teaching of Basic Science and Technology so as to increase achievement and retention in the subject. Also, peer tutoring instructional strategy is gender friendly and should therefore be used in teaching of Basic Science and Technology to enhance the achievement and retention of male and female students in the subject.

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