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EFFECT OF PEER TUTORING INSTRUCTIONAL STRATEGY ON SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN EVOLUTION IN NASARAWA STATE, NIGERIA

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Abstract

This study determined the Effects of Peer tutoring instructional strategy on secondary school students' achievement in evolution in Nasarawa State, Nigeria. The study adopted a quasi-experimental pre-test, post-test, non-randomized control group design. Two research questions guided the study and two null hypotheses were formulated and tested at 0.05 level of significance. Random sampling technique of the lucky draw method was used to select three co-educational public secondary schools in Nasarawa West Senatorial District. A sample of 146 SS3 students drawn from a population of 4,631 students offering biology in 2024/2025 academic session in the Nasarawa senatorial district was used. A 30 multiple-choice item on the Evolution Achievement Test (EAT) was used as an instrument for data collection. These items were validated by three experts from the Department of Science, Technology, and Mathematics Education of the Faculty of Education, Nasarawa State University, Keffi. The reliability of the Evolution Achievement Test was determined using the Kuder-Richardson formula (K-

R21), yielding an estimate of 0.92. Descriptive statistics of mean and standard deviation were used to answer the research questions and Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. Findings from the study revealed that students taught evolution using the Peer Tutoring instructional strategy achieved higher scores than those taught using the conventional method. The findings also reveal that there was a significant difference in the achievement of male and female students exposed to Peer Tutoring instructional strategy in favour of female students. No significant interaction effect between instructional strategy and gender on students' achievement in evolution was found. It was therefore recommended that instructional strategies, such as Peer Tutoring, be adapted by biology teachers to teach evolution.

Keywords: Effect, Peer Tutoring Instructional Strategy, Achievement, Evolution.

Introduction

Biology is considered as the mother of other science subjects as it is the study of life and

living things. The study of science is important because it provides opportunities

for learners to acquire functional knowledge and skills that are needed for advancement in a science and technologically driven world. Many nations have invested heavily in science education to produce scientists, technologists, engineers, and technicians, making society scientifically literate for sustainable growth and technological advancement, thereby meeting the world's challenges. There is, therefore, no doubt that any strategy or technique that would improve science teaching and learning should be encouraged. This encouragement is to help learners acquire and put to practice scientific skills in order to develop their conceptual understanding and ability (Datiri, 2023). Biology, as one of the important science subjects offered in secondary schools in Nigeria, attracts the greatest patronage of both science and art-based students. Nwosu (2016) mentioned that the teaching of biology is important because the knowledge of biology is needed to be able to function effectively in our modern world, where the effects of climate change threaten our health by affecting the food we eat, the water we drink, the air we breathe and the weather conditions around us. The importance of biology and its broadness cuts across almost all scientific fields, making it expedient for everyone to be biologically literate (Datiri, 2023).

Biology is applied in the field of Medicine, Veterinary science, Pharmacy, Agriculture

and Literature, biotechnology and in food production. Other advanced recorded fields in Biology include: Biochemistry, Physiology, Genetics, Ecology, and Molecular Biology. The Biology curriculum in secondary schools in Nigeria comprises five broad areas. These areas are: basic ecological concept, concept of living, plant and animal nutrition, variation and variability, evolution and genetics. These contents are taught and repeated annually throughout the three-year duration of biology at the senior secondary school (SS1–SS3) level to cover all units in the curriculum as stipulated in the National Policy on Education (FRN, 2014). Biology is considered one of the three natural science disciplines most commonly studied by secondary school students in Nigeria. (Nzuwuihe & Ogunshola, 2016). It is regarded as the simplest among the science subjects and has thus attracted the widest enrolment among Nigerian students. Despite its popularity, students' performance in the Senior Secondary School Certificate Examination (SSCE) has not been encouraging. This is evident from the available statistics of WAEC results from schools under the Nasarawa State Ministry of Education and the results from the West African Examination Council (WAEC) (2016 to 2024), chief examiners' reports on senior secondary school students' performance in senior secondary certificate

examination (SSCE) Biology, which revealed that students' achievement was below average.

Table 1: Nasarawa State Students Achievement in SSCE Biology from 2016 – 2024

Year	Percentage passes at credit (A1 – C6)	Percentage failure (FD)
2016	41.80	58.20
2017	31.86	68.14
2018	39.44	60.56
2019	40.05	59.95
2020	38.14	61.86
2021	39.26	60.74
2022	41.34	58.66
2023	40.20	59.80
2024	40.51	59.49

Source: Education Resource Centre (ERC), Nasarawa State Ministry of Education, Lafia (2024).

Table 1.1 shows that students' achievement in biology has been poor and below average. The WAEC chief examiners' reports for the period under review (2016 – 2024) indicated that poor achievement in Biology may be largely due to poor performance in practical aspects and in complex topics such as evolution, as reported by Oka (2021). The examiner's report provides a detailed assessment of students' comprehension and understanding of the questions in relation to the specification content (Woodger, 2019; Datiri, 2023). These reports give a general overview of students' achievement on the questions asked and state the common mistakes found in students' answers. It is on this basis that the present study found evolution a concept perceived as difficult by

students. The content covered in evolution in senior secondary schools in Nigeria, according to the curriculum, includes: Introduction to evolution, organic evolution and variation in relation to living organisms, relationship between variation and evolution, types of variation (morphological and physiological), population and variation, factors affecting population size (FRN, 2014).

Many factors have been associated with students' poor achievement in Biology. Igboanugo and Njoku (2015) listed the following factors: learning environment, overloaded curriculum, teaching methods, and conventional teaching strategies used by teachers.

Underachievement in evolution is associated with some concepts in evolution that teachers find difficult to teach and students find difficult to learn, such as diversity, natural selection, variation, genetics, and biological mutation. Ajayi and Lawani (2015) attested that poor instructional strategies employed by teachers in teaching of subjects contribute in no small measure to students' disinterest and underachievement. Hence, evolution and evolution-related concepts have a reputation of being hard to teach and hard to learn, despite the fact that knowledge of evolution is indispensable for scientific literacy (Glaze & Goldston, 2015). Evolution as a concept in Biology contradicts the religious beliefs of divine creation account stated in the Quran (Surah An-Nur vs 4-5) and the Bible (Genesis chapter 1 verse 1). Issues on creationism arise where the Quran and Bible state that a supernatural being (God) created everything. At the end, students seem not convinced, burdened by misconceptions, and confused about the changes that result from the concept of evolution as taught in the classroom (Noma, David, & Christiana, 2020).

For effective learning to take place, teachers would need to adopt novel methods and approaches in teaching evolution, as Datiri (2023) highlighted. Akpan (2018) submitted that the Federal Republic of Nigeria (FRN, 2014), as reflected in the National Policy on Education, emphasizes the teaching and

learning of science, focusing on the development of students' thinking and cognitive skills. Science teaching should be based on creative thinking to generate and develop ideas that help solve societal problems, and on reflective thinking to evaluate them. In recent times, attention are now being shifted from the traditional method of teaching which is more of teacher centered and seriously limits students understanding, active involvement and interaction to strategies that permits students active involvement in learning process which yield immediate feedback mechanism on individual construction of knowledge (Nnorom, 2015; Kayode, 2021) states that researchers in recent times have recommended learning strategies and method that will enable learners to construct their own understanding of topics and concepts. These methods and strategies are up shoots of the constructionism theory.

Peer tutoring strategy is one of these strategies. A strategy traced back to Roman and Greek ages, involves students teaching other students. It is a teaching strategy where a group of students interacts to help each other's learning by one of the students assuming the sole role of tutor and the other role of tutees. The activity was not formally organized by any teacher but by volunteer students who are good in some subjects and willing to help other students in difficult areas in those subjects. In this strategy,

students learn new ways and short-cuts to problem solving by applying new skills, knowledge, and solutions to each other's problems through playing and sharing ideas. (Kayode, 2021). Animola (2019) stated that peers are more sensitive, active and responsive to picking up science concepts and non-verbal cues. Each participating student receives more attention from the tutor and is freer to speak, interact, and contribute to topical issues beyond the purview of the instructional content. Achievement results from effort and perseverance in reaching a goal. It is the action of accomplishing a task successfully. Ella (2017) defined achievement as the extent to which a learner has attained short- or long-term educational goals, as measured by the amount of academic content a student learns in a given time frame. Students' achievement in a particular subject indicates their standing in that subject, thereby determining the efficacy and efficiency of a given instruction (Kabutu, Oloyede & Bamidele, 2015).

Statement of the Problem

The achievement of students in Biology in the West African Examination Council, according to the reports of the Chief Examiner for the years under review (2016 to 2024), is below average and not encouraging. Evolution has been identified as one of the concepts in biology that students perform woefully. The effects of poor achievement of

students in evolution translates to poor achievement in biology because a good percentage of the questions asked in the West African Examination Council spans through evolution related concepts. The need to use activity oriented and learner-centered strategies of teaching is therefore required. The conventional teaching method of note-taking and lecture giving lacks the students' cooperation and interaction required for effective learning and transfer of learning of biology concepts. The conventional method used is not producing the desired results in the students' achievement, thus a search for alternative teaching strategies should be conducted aimed at enhancing students' achievement. Among such strategies is Peer Tutoring instructional strategy. This study investigated the effects of Peer tutoring instructional strategy on secondary school students' achievement in evolution in Nasarawa State, Nigeria.

Objectives of the Study

The study sought to:

- i. determine the effect of peer tutoring instructional strategy on students' achievement in evolution.
- ii. ascertain the influence of male and female students' achievement in evolution when taught using peer tutoring instructional strategy.

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of students taught evolution using peer tutoring instructional strategy and the conventional method?
2. What are the mean achievement scores of male and female students taught evolution using peer-tutoring instructional strategy?

Statement of Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance.

H₀₁: There is no significant difference in the mean achievement scores of students taught evolution using peer tutoring instructional strategy and the conventional teaching method

H₀₂: There is no significant difference in the mean achievement scores of male and female students taught evolution using a peer tutoring instructional strategy.

Methodology

The study determined the effect of peer tutoring instructional strategy on secondary school students' achievements in evolution in Nasarawa State, Nigeria. Quasi –

experimental design, a non-randomized pre-test, post-test control group was adopted, and the population of the study comprised 4,631 Senior Secondary Three (SS III) students offering biology in Government-owned Senior Secondary Schools in Nasarawa West Senatorial District of Nasarawa State for the 2024/2025 academic session. The study sample consisted of 146 students (73 males and 73 females) enrolled in biology courses from the West Senatorial district of Nasarawa State.

Multistage sampling technique was used to draw the sample from three public Co-educational secondary schools in the West Senatorial District of Nasarawa State. The instrument used was the Evolution Achievement Test (EAT) with 30 multiple-choice items. The instrument was validated by three experts from the Department of Science, Technology, and Mathematics Education of Nasarawa State University, Keffi, to ensure its relevance to the study. A validity index of 0.92 was obtained using Kuder-Richardson ($K-R_{21}$) formula. Research questions were answered using mean and standard deviations while the null hypotheses were tested using analysis of covariance (ANCOVA) at 0.05 level of significance.

Results

The data were presented and analyzed according to the research questions and null hypothesis formulated.

Research Question 1: What are the mean achievement scores of students taught evolution using peer tutoring instructional strategy and the conventional method?

Table 2: Mean Achievement Scores and Standard Deviation of Students Taught Using Peer Tutoring Instructional Strategy and the Conventional Method

Group		Pretest	Posttest
PT	Mean	51.02	63.83
	N	48	48
	Std. Deviation	14.477	12.419
CM	Mean	59.12	65.37
	N	52	52
	Std. Deviation	13.761	13.583

Table 2 shows the mean achievement scores of students taught evolution using the peer tutoring instructional strategy and the conventional method. The PTIS group had a pretest score of 51.02 and a post test score of 63.83. and the CM group had a pre-test score of 59.12 and a post-test score of 65.36.

Hypothesis One

There is no significant difference in the mean achievement scores of students taught evolution using peer tutoring instructional strategy and conventional teaching method.

The result of the test of this hypothesis is presented in Table 2.

Table 3: ANCOVA Result of Mean Achievement Scores of Students Taught Evolution Using Peer Tutoring Instructional Strategy and Conventional Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	16748.507 ^a	3	5582.836	75.723	.000	.610
Intercept	5509.327	1	5609.327	76.083	.000	.344
Pretest	15374.767	1	15374.767	208.537	.000	.590
Group	639.405	2	319.702	4.336	.015	.056
Error	10690.366	145	73.727			
Total	610408.000	149				
Corrected Total	27438.872	148				

a. R Squared=.610 (Adjusted R Squared= .602)

Table 3 reveals that $F_{(2,145)}$ of 4.336 was obtained with an exact associated probability ratio of 0.015 ie. ($F_{(2,145)} = 4.3336$; $P = 0.015 < \alpha = 0.05$). Since the associated probability (0.015) is less than 0.05 set as the level of significance, the null hypothesis was rejected. This implies that a significant difference was found to exist in the mean

achievement scores of students taught evolution using peer tutoring instructional strategy and conventional method. Based on the established difference in the achievement scores of the groups, Bonferroni Multiple Comparisons were used to determine the direction of the difference. The results of this analysis are shown in Table 3.

Table 4: Bonferroni Multiple Comparisons Results of Mean Achievement Scores of Students Taught Evolution Using Peer Tutoring Instructional Strategy, Jigsaw III Instructional Strategy and Conventional Method

(I)Group	(J)Group	Mean Difference (I-J)	Std. Error	Sig. ^b	95% confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
PT	Jig III	4.058	1.747	.065	-.173	8.288
	CM	-.644	1.720	1.00	-4.810	3.521
Jig III	PT	-.4.058	1.747	.065	-8.288	.173
	CM	-4.702*	1.717	.021	-8.861	.543
CM	PT	.644	1.720	1.000	-3.521	4.810
	Jig III	.4.702*	1.717	.021	.543	8.861

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni

Table 4 shows that there was no significant difference in the mean achievement scores of students exposed to peer tutoring strategy and the conventional method. Conventional group had a P value of 1.000, since 1.000 is greater than 0.05 set as the benchmark of significance, the hypothesis was not rejected which implies no significant difference between the mean achievement scores of students exposed to peer tutoring

instructional strategy and the conventional method. The CM group and the Jig III group had a P value of 0.021. Since 0.021 is less than 0.05, set as the benchmark of significance, the hypothesis was rejected, which implies a significant difference between the mean scores of students exposed to peer tutoring and the conventional method in favour of peer tutoring.

Research Question Two

What are the mean achievement scores of male and female students taught evolution using peer tutoring instructional strategy?

The data that answered this research question is presented in Table 4.

Table 5: Mean Achievement Scores and Standard Deviation of Male and Female Students Taught Evolution Using Peer Tutoring Instructional Strategy

Gender PT		Pretest	Post test
Male	Mean	50.44	62.36
	N	25	25
	Std. Deviation	14.242	12.003
Female	Mean	51.66	65.43
	N	23	23
	Std. Deviation	15.023	12.929

Table 5 reveals the mean achievement scores of male and female students exposed to peer tutoring instructional strategy. The male students had a pretest score of 50.44 with a standard deviation of 14.242 and a posttest

score of 62.36 with a standard deviation of 12.003, while the female students had a pretest score of 51.66 with a standard deviation of 15.023 and a posttest score of 65.43 with a standard deviation of 12.929.

Hypothesis Two

H₀₂: There is no significant difference in the mean achievement scores of male and female students taught evolution using peer tutoring instructional strategy.

The result of the test of this hypothesis is presented in Table 5.

Table 5: ANCOVA Results of Mean Achievement Scores of Male and Female Students Taught Evolution Using Peer Tutoring Instructional Strategy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4024.304 ^a	2	2012.152	28.082	.000	.555
Intercept	3516.417	1	3516.417	49.076	.010	.522
Pretest	3911.050	1	3911.050	54.584	.000	.548
Gender PT	63.825	1	63.825	.891	.350	.019
Error	3224.362	45	71.652			
Total	202834.000	48				
Corrected Total	7248.667	47				

a. R Squared = .555 (Adjusted R Squared = .535)

Table 5 shows the result of ANCOVA of the achievement scores of male and female students taught evolution using peer tutoring instructional strategy. It was observed that $F_{(1,45)} = 0.891$, with a corresponding p-value of 0.350. ie. $F_{(1,45)} = 0.891$; $P = 0.350 > \alpha = 0.05$. Since the associated probability of

0.350 is greater than 0.05 set as the level of significance, the hypothesis was not rejected. It therefore means that there is no significant difference in the mean achievement scores of male and female students taught evolution using peer tutoring instructional strategy.

Discussion of Findings

Findings from this study revealed a significant difference in the mean achievement scores of students taught evolution using a peer tutoring instructional strategy compared with those taught using a conventional method. This findings align with previous studies of (Azeez et al., 2022; Odo and Nwachukwu (2020); and Inyang (2019) who found out that students' achievement were enhanced when they were exposed to cooperative instructional strategies like peer tutoring but in disagreement with the findings of Egya (2021) who found no significant difference in the achievement of male and female students exposed to jigsaw I instructional and peer tutoring instructional strategies in mole concepts. The trend of an enhanced achievement observed in the treatment groups could be a result of the learning environment the students were provided, where they had to work in groups and in teams, causing them to share understanding and encouragement. Another possible reason for the improved achievement of the students

in the experimental group may be that they took charge of their learning process through collaboration, which offered them the opportunity to develop cognition. Another possible reason for the improved achievement of the students in the experimental group may be that they took charge of their learning process through collaboration, which offered them the opportunity to develop cognition. This aligns with Vygotsky's (1978) submission that knowledge is co-constructed and that individuals learn from each other, especially when they are allowed to participate in the learning process. The findings imply that the instructional strategy employed by teachers in teaching evolution might have been partly responsible for students' underachievement in evolution, as teachers mostly use the conventional method.

Conclusion

The need for improvement led to the conception of this study, which examined the effects of Peer Tutoring instructional strategy on students' achievement in evolution. From

the findings of this study which was based on the ANCOVA and statistical analysis of data collected, the following conclusions were arrived at: Peer Tutoring instructional Strategy (PTIS) is more effective and significantly better than Conventional Method of Teaching. This means that using PTIS to teach evolution would be preferred as it can improve students' achievement in evolution more than those taught without it. The results also confirmed that gender had a significant effect on the mean interest rating of students taught evolution using PTIS in favour of the female students, but had no significant effect on the mean interest rating of students taught evolution using the Jigsaw III instructional strategy. It was also confirmed that instructional strategies and gender had no interaction effect on students' interest and achievement.

Recommendations

The following recommendations were made based on the findings of this study;

1. Biology teachers be encouraged to use Peer tutoring and Jigsaw III instructional strategies to teach evolution and other difficult and abstract topics in biology (like genetics, nervous system and homeostasis) to enhance the overall achievements of students. Students should be encouraged to work in groups to promote self-confidence and

individual accountability, thereby providing an opportunity for equal achievement.

2. Ministries of education at both Federal and State levels should organize seminars and workshops to train teachers and keep them abreast with latest trends in education and on the use of Peer tutoring and Jigsaw III instructional strategies. Curriculum planners are urged to include the Peer tutoring and Jigsaw III instructional strategies among the recommended strategies to be used in classes.

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