

**ANALYSIS OF THE EFFECT OF PEER TUTORING ON
ACHIEVEMENT OF STUDENTS TOWARDS ECOLOGY IN
COLLEGES OF EDUCATION IN NORTH WESTERN ZONE OF
NIGERIA**

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ABSTRACT

This study investigated the effect of peer tutoring on the achievement of students in ecology in colleges of education in the North-Western zone of Nigeria. The study adopted a quasi-experimental pretest, a post-test control group design. The sample of 128 students from two(2) colleges of education out of seven (7) colleges of education in Kano State from a population of 2900, form the intact classes for the study. Each intact class was randomly selected from NCE 1 Biology students, each arm containing 64 students. Ecology Achievement Test (EAT) was the instrument used in this study for data collection, it was adopted from NCE 1 past moderated examination questions that comprise 40 multiple-choice expert-validated questions. The split-half reliability coefficients of EAT were established. Three research questions guided the study and three corresponding null hypotheses were tested at 0.05 level of significance. The experimental group was taught using peer tutoring while the control group was taught using the lecture method. A pretest was administered to both groups. The experimental group was taught ecology using peer tutoring, while the control group was exposed to the lecture method for a period of six weeks. The results showed that the Experimental group (Mean=31.6) perform better than the Control group (Mean=24.9). The result showed that males in the Experimental group achieved higher mean scores (Mean=31.89) than those in the Control group (Mean=23.55.9). Results showed that female students taught using peer tutoring (M = 31.34) perform better than those taught using the lecture method (M = 26.64). From the findings of the study, it was recommended that the Administrations of Colleges of Education in the northwest zone in Nigeria should enforce the

use of a variety of approaches in teaching. Such an approach should include the use of social interaction and a cooperative learning approach, the use of lecture methods by teachers should be reduced. Rather, a constructivist approach that calls for social interaction among students should be a dominant approach.

Keywords: Peer tutoring, Student's Achievement, Ecology, Teaching, Learning

1.0 INTRODUCTION

The shift in recent times in science teaching and learning over the years worldwide is to have a science classroom that is student-centered, activity-oriented, and focused on understanding rather than rote learning and simple recall of knowledge Tuckman (1975) and (Owolabi, 2007). Science education is a fundamental component of basic education that prepares children to live in a world that is increasingly defined by science and technology (International Council for Science, 2002). Biology serves as a prerequisite to the study of medicine, agriculture, and pharmacy among others. Biology is the study of plants and animals which partly provides the scientific literacy required for national growth and development. Biology is a broad field, covering the minute chemical component of cells, to a broad study of the ecosystem. Ecology is defined as the study of the relationship of organisms or groups of organisms and their environment, or the science of the interrelationship among living organisms and their environment. Some of the concepts in Ecology are habitat, population, ecosystem, succession, adaptation, conservation, pollution, cycling material, biological control, community, biotic interaction, soil studies erosion, ecology and disease, sewage disposal, ecological study, feeding relationship, energy, environment to mention just a few.

Learning impact depends on how materials are presented to learners and how active learners interact with the learning experiences being presented. The new trend in teaching-learning of science, technology, engineering, and mathematics (STEM) demands a radical departure from the traditional lecture method to an innovative strategy. These innovative strategies often involve problem-solving activities and active participation of learners and cooperation among learners, even in open-ended field science of practical laboratory exercises and technology workshops activities. The conventional lecture method has been discouraged because it is found to be teacher-dominated and tends to make students passive listeners and redundant recipients of knowledge. Another argument against conventional methods of teaching according to Isaac, Sambo, Abimiku & Emmanuel (2014 a, b & c), and Sambo (2018) is that it encourages memorization and rote learning of concepts without allowing students to be really exposed to the challenges that will make them be actively engaged. The over-reliance on these conventional methods of teaching-learning has tended to influence students' performance in the subjects related to science and technology.

Academic achievement of students is the ability of the students to study or being under teaching-learning activities, remember facts that he studied or learned and be able to communicate their knowledge orally in written form even in an examination condition. Okoye (1996) stated that achievement test questions are used to assess a person's performance in a course of study, which is undergone at the end of a course, a test is given covering the area taught in a course to check the academic achievement level of the students. According to Chew (2004), Biology can sometimes be difficult, particularly when describing

abstract concepts that cannot be fully comprehended for the first time. Some of the difficult concepts taught in Biology are ecology, evolution, genetics, and physiology among others (Oyedokun, 2002; WAEC Chief Examinations' Report, 2006). Research findings have shown that a number of concepts in biology including ecology contain topics that pose difficulty for biology students to comprehend (Esiobu & Soyibo, 1995).

Achievement is the past-oriented way of trying to measure the degree of attainment or success of an individual in an area or activity after adequate training has been carried out (2011a & 2011b and Sambo, 2014 a & b, 2017, 2019a.). In the study already done, the achievement of students in Basic Science and Technology was determined after adequate teaching has been done for four weeks. Achievement tests are used to measure achievement in a learner. Achievement looks at the past and indicates what an individual has learned or acquired in a particular field. In Measurement and evaluation, aptitude and achievement are both measures of affability (Sambo, 2010 & Anikweze, 2013). Aptitude denotes what a person has learned to do without requiring any training while achievement refers to what one has learned to do as a consequence of training.

In the same vein, Danjuma (2005) and Mankilik & Sambo (2010) stated that poor performance might be due to poor methods of teaching and insufficient instructional materials. However, Nebo (2012 and Sambo (2017)) stated that the conventional method of teaching has failed to recognize the uniqueness of the inquiry-based nature of Biology and the learner's individuality thus failing to encourage creative thinking in the learner leading to the poor achievement of students. Based on these, science educators and scholars are challenged to seek intervention or innovative methods that would enhance the academic achievement of students in Biology. Some of these methods include concept mapping, discovery method, cooperative learning strategies, target task approach, and Peer tutoring.

Peer tutoring is an instructional strategy that consists of student partnership, whereby student teaches his peers, linking high achieving students with lower achieving students or those with comparable achievements (Gbamanja, 1991, Zayum & Jibrin, 2012, Amaka, 2013 Samuel & Sambo, 2019). Peer tutoring is very significant in the context of learning among students and it offers some advantages such as peer tutors speak the same language and can connect with the students, peer tutors serve as a role models to the students, students is working with other students comfortably and less afraid of asking questions.

The influence of students' gender on their achievement in ecology Basic Science and Technology has been of concern to education researchers for a long. Yet according to Sambo (2003), Sambo (2010, 2014a, b and c), and Nzewi (2015), no trend had emerged on the issue. In Nigeria, gender bias is still prevalent in science and technology education spheres; it has persisted even within the Basic Technology classroom. Mankilik & Sambo (2010) pointed out that Nasarawa state as one of the States in the North Central geopolitical zone of Nigeria is often considered one of the educationally disadvantaged states, especially in terms of female access to and aspiration in science and technology subjects at Secondary school level. There is no evidence yet on whether comparing the effect of the use of peer tutoring and achievement is gender-related. It is, therefore, worthwhile to find out if peer tutoring and achievement would bridge the gap in achievement between male and female students taught ecology at the college of Education levels.

It is against this backdrop that the researchers investigated the effect of peer tutoring on the achievement of students in Ecology in Colleges of Education in the North Western Zone of Nigeria.

2.0 OBJECTIVES OF THE STUDY

The main purpose of this study was to investigate the effect of peer tutoring on students' achievement in ecology among Colleges of Education Students in the North-Western Zone of Nigeria. Specifically, the study intended to:"

1. Investigate the effects of Peer tutoring and lecture method on students' mean achievement scores in ecology.
2. Determine the effects of Peer tutoring on male students' achievement scores taught Ecology using Peer tutoring and lecture method.
3. Find out the mean achievement scores of female students taught ecology using Peer tutoring and lecture method.

2.1 Research Questions

"The following research questions were formulated to guide this study;

1. What are the mean achievement scores of students taught ecology using Peer tutoring and lecture method?"
2. What are the mean achievement scores of male students taught ecology using Peer tutoring and lecture method?
3. What are the mean achievement scores of female students taught ecology using Peer tutoring and lecture method?

2.2 Null Hypothesis

"The following null hypotheses were formulated and tested at a 0.05 level of significance

HO1 There is no significant difference in the mean achievement scores of students taught ecology using peer tutoring and those taught using the lecture methods.

HO2 There is no significant difference in the mean achievement scores of male students taught ecology using peer tutoring and those taught with the lecture method.

HO3 There is no significant difference in the mean achievement scores of females students taught ecology using peer tutoring and those taught with the lecture method.

3.0 METHODOLOGY

The study adopted a quasi-experimental pre-test and post-test Control group research design. The study population comprises 2900 NCE1 Biology students in the North-Western Zone of Nigeria in public Colleges of Education run by the State Government. Of this population, 1920 are males and 980 are female. This class was selected because the ecology concept is taught at the NCE1 level prescribed by the National Commission for Colleges of Education

(NCCE) in her Minimum Standards. There are seven (7) public colleges of education in the North Western Zone of Nigeria.

From this population, a total number of 128 NCE 1 Biology students drawn from two Colleges of Education in the North Western Zone of Nigeria form the sample of the study. Simple random sampling (Hat and Draw Method) was used to select two (2) colleges of education out of seven (7) Colleges of Education, at Kano State. The two schools selected with the aid of a flip of the coin were assigned to the experimental group and the control group; an intact class was used in each of the colleges of education for the study. The sample is viable in accordance with the central limit theorem that recommends 30 Participants as the minimum sample size for an experimental study (Tuchman 1975). Intact class in each of the colleges of education was randomly selected from NCE 1 Biology students, each arm containing 64 students.

The instrument used in this study for data collection was Ecology Achievement Test (EAT), EAT consisted of 40 multiple-choice questions that survived validation with five options letters (A to E), they were developed by the researcher using six levels of Blooms Taxonomy in the cognitive domain namely, knowledge, comprehension, application, synthesis, analysis, and evaluation.

The experimental group was exposed to peer tutoring while the control group was exposed to the lecture method. A pre-test was administered to both groups to determine the equivalence of the groups before the treatment commenced. At the expiration of the six weeks treatment, a post-test was administered to the two groups to ascertain the effect of the treatment on the groups. The Statistics used to test the hypotheses was a split-half form of reliability.

4.0 RESULT

Research Questions 1:

What are the mean achievement scores of students taught ecology using Peer tutoring and lecture method?"

Table 1: Mean And Standard Deviations Of Achievement Scores Of Students Taught Ecology Using Peer-Tutoring

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	128	9.0	40.0	18.266	7.2421
Posttest	128	11.0	40.0	28.289	7.1256

Table 1 shows the descriptive statistics of variables. The table indicates that the mean scores of the pretest are 18.26, with minimum and maximum scores of 9.0 and 40.0 respectively. Mean post-test scores are also 28.28, with minimum and maximum scores of 11.0 and 40.0 respectively. This revealed that students performed better when taught ecology using peer – tutoring.

Hypothesis 1: Ho1: There is no significant difference in the mean achievement scores of Students taught ecology using peer tutoring and those taught using lecture method

Table 2: Mean Achievement Scores Of Students Taught Ecology Using Peer Tutoring And Those Taught Using Lecture Method.

Source	Type III Sum of Squares	Df	F	Sig.	Partial Eta Squared
Pretest	1886.767	1	76.158	.000	.379
Group	588.327	1	23.748	.000	.160
Error	3096.780	125			
Group	Mean	Std. Deviation			
Experiment-group	31.67	6.37			
Control-group	24.9	6.19			

Dependent Variable: Posttest

Table 2 shows the mean achievement scores between students taught with peer tutoring and those taught with the lecture method. A one-way Analysis of Covariance was conducted to compare the difference between the two treatments groups. The independent variable was the type of treatment (peer tutoring and lecture method) and the dependent variable consisted of scores of achievement tests after treatment was completed. Participants' scores on the pretest were used as the covariate. After controlling for pretest scores, there was a significant difference between the two treatment groups on post-intervention scores of the achievement test [$F(1, 125) = 23.74$; $p=0.000$; partial Eta Squared=0.1]. There was also a strong relationship between the scores on pretest and scores on posttest, as indicated by a partial eta squared value of 0.3. An inspection of the mean scores shows that the Experimental group (Mean=31.6) performs better than the Control group (Mean=24.9). In view of the results above, the research hypothesis was therefore rejected.

Research Question 2: What are the mean achievement scores of male students taught ecology using Peer tutoring and lecture method?

Table 3: Mean Achievement Scores Of Male Students Taught Ecology Using Peer Tutoring And Lecture Method?

Group	Sex	Frequency	Percent
Exp	Male	38	59.4
Cont	Male	36	56.3
	Total	74	100.0

The table shows that males in the experimental groups performed better at 38 (59.4%) than males in the control group with 36 (56.3%).

Hypothesis 2: Ho2: There is no significant difference in the mean achievement scores of male Students taught ecology using peer tutoring and those taught with lecture method.

Table 4: ANCOVA Results in Of Mean Achievement Scores between Male Participants Taught With Peer Tutoring and Those Taught With Lecture Method

Source	Type III Sum of Squares	Df	F	Sig.	Partial Eta Squared
Pretest	1126.072	1	40.742	.000	.365
Group	524.864	1	18.990	.000	.211
Error	1962.395	71			
Group	Mean	Std. Deviation			
Experiment-group	31.89	7.0			
Control group	23.55	6.0			

Dependent Variable: Posttest

Category = Male

Table 4, shows the mean achievement scores between male students taught with peer tutoring and those taught with the lecture method. A one-way Analysis of Covariance was conducted to compare the difference between the two treatments groups. The independent variable was the type of treatment (peer tutoring and lecture method) and the dependent variable consisted of scores of achievement tests after treatment was completed. Participants’ scores on the pretest were used as the covariate. After controlling for pretest scores, there was a significant

difference between the two treatment groups in post-intervention scores on the achievement test [$F(1, 71) = 18.99; p=0.000$; partial Eta Squared=0.2]. There was also a strong relationship between the scores on pretest and scores on post-test, as indicated by a partial eta squared value of 0.3. An inspection of the mean scores shows that males in the Experimental group (Mean=31.89) perform better than those in the Control group (Mean=23.55.9). In view of the results above, the research hypothesis was therefore rejected.

Research Question 3: What are the mean achievement scores of female students taught ecology using Peer tutoring and lecture method?

Table 5: Mean Achievement Scores Of Female Students Taught Ecology Using Tutoring And Lecture Method?

Group		Frequency	Percent
Exp.	Female	26	43.8
Control	Female	28	40.6
	Total	54	84.4%

Table 5, shows that 26 (40.6%) female participants make up the Experimental group while 28 (43.8%) females make up the Control group. In general, 54 (42.2%) female participants make up the study. Females in the experimental group perform better than the control group.

Hypothesis 3: HO3: There is no significant difference in the mean achievement scores of female Students taught ecology using peer tutoring and those taught with lecture method.

Table 6: ANCOVA ResultsOf Achievement Scores Between Female Participants Taught With Peer Tutoring And Those Taught With Lecture Method

Source	Type III Sum of Squares	Df	F	Sig.	Partial Eta Squared
Pretest	689.894	1	33.496	.000	.396
Group	120.654	1	5.858	.019	.103
Error	1050.419	51			

Group	Mean	Std. Deviation			
Experiment-group	31.34	5.45			
Control-group	26.64	6.07			

Dependent Variable: Posttest

Category = Female

Based on the result presented in table 6, a one-way Analysis of Covariance was conducted to explore the effect of peer tutoring on female students' performance in ecology, while controlling for scores on the pretest. Subjects were grouped according to treatments given. The independent variable was the type of treatment (peer tutoring and lecture method). The dependent variable was scored on the post-achievement test (posttest). Scores on the pretest were used as the covariate. After controlling for pretest, a significant difference was noticed in the achievement scores between female students taught using peer tutoring and those taught using the lecture method [$F(1, 51) = 5.8$; $p = 0.019$; partial eta squared = 0.1]. When the independent variable was controlled, a strong relationship was noticed between the pretest and the posttest [$F(1, 51) = 33.49$; $p = 0.00$; partial eta squared = 0.3]. The mean scores show that female students taught using peer tutoring ($M = 31.34$) perform better than those taught using the lecture method ($M = 26.64$). The research hypothesis was therefore rejected.

5.0 DISCUSSION OF FINDINGS

Findings from research hypothesis one revealed that there was a significant difference in the mean achievement scores between students engaged in peer tutoring and those taught using the lecture method in an ecology class when pretest scores are controlled for. This significant difference cuts across male and female students as revealed by research hypotheses two and three. For example, research hypothesis two indicates that male students engaged in peer tutoring perform better than their counterparts taught using the lecture method with a significant difference noticed. Research hypothesis three also revealed that female students engaged in peer tutoring perform better than their counterparts taught with the lecture method with a significant difference noticed. This indicates that peer tutoring gives room for better performance. Indeed, in peer tutoring, the number of students involved is reduced, thereby giving low achievers the chance of asking questions without feeling shy. It also gives room for repetition of concepts over again. Peer tutoring as an individualized approach to teaching and learning caters to individual differences as against the lecture method which treats students as a whole and assumes that everyone understands.

Furthermore, learners engaged in peer tutoring are likely to perform better given the fact that their learning impairments will be catered for. For example, learners with a high level of introversion will have a better chance of asking questions when they are taught by their peers. In addition to this, difficult concepts are likely to be explained in more detail. Students with emotional detachment are likely to pay more attention when taught with peers tutoring. These

relative advantages of peer tutoring over the lecture method could be responsible for the significant difference recorded by the study as well as the better performance of students in the experimental group. This finding concurred with the findings of Zayum & Jibrin (2012) who found a significant difference in the performance of students taught with peer tutoring and those taught with the expository method. Zayed also noticed that students who taught biology using the peer tutoring instructional method achieved higher than those taught using the expository method.

The findings of the study also concurred with the findings of Nworgu and Ezenwosu (2013) who found a significant difference in the academic achievement of biology between students taught using peer tutoring and those taught using the lecture method. On the basis of their findings, it indicates that since the year 2012, peer tutoring was a more significant method than the lecture method in terms of academic achievement. Their findings also indicate that peer tutoring favors males and females more than in the conventional method. The findings of the study also support Vygotsky' (1978) social constructivist theory which suggests that cognitive development is limited to a certain range at a particular age. However, with the help of social interaction, such as assistance from a mentor, students can comprehend concepts and schemes that they cannot know on their own. The construction of ideas directly depends on negotiation between people as there are no two individuals that think the same.

6.0 CONCLUSION

Based on the findings of the study, it can be deduced that peer tutoring approach impacts positively on the performance of students when compared to the lecture method, particularly in Ecology class. The approach could also change students' negative attitudes to positive ones toward ecology than the lecture method.

7.0 RECOMMENDATIONS

The following recommendations were made:

1. Administrations of Colleges of Education in the northwest zone in Nigeria should enforce the use of a variety of approaches in teaching. Such an approach should include the use of social interaction and a cooperative learning approach.
2. The use of lecture methods by teachers should be reduced. Rather, a constructivist approach that calls for social interaction among students should be a dominant approach.
3. High achieving students should help low achieving ones using the peer tutoring approach. This would break the cycle of failure, particularly in ecology concepts.
4. However, considering the high number of students in Colleges of Education in the North West Zone of Nigeria, the lecture method can be used for the introduction of concepts. Constructivist approaches such as peer tutoring should be for reinforcement.

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