Effect of Peer Tutoring on Academic Performance and Retention in Ecology among Senior Secondary School Students in Kaduna State

Adeola Adebimpe, DANIEL
Department of Science Education, Faculty of Education
Ahmadu Bello University, Zaria
Tel: 08039584564
Email: adeoladaniel1872@gmail.com

Abstract
This study investigated Effect of Peer Tutoring on Academic Performance and Retention in Ecology among Senior Secondary School Students in Kaduna State. The study was guided by two objectives, two research questions and two null hypotheses. Sixty (60) SS2 students were selected using the simple random sampling technique from a population of six hundred (600) SS2 students who offer biology using simple random sampling technique. This study adopted the pretest, posttest and post-posttest quasi experimental research design involving two groups. One tagged experimental and the other control. The students in the experimental group were taught ecology concept using the P-TLS while the control group were taught the same concept using lecture method. The Ecology Performance Test (EPT) was used for data collection. The EPT was duly determined and had a reliability value of 0.88 that was subjected to the Pearson Product Moment Correlation (PPMC). The research questions were answered using mean and standard deviation, while the hypotheses were tested at 0.05 level of significance using t-test. The result obtained from data analysis showed that students in experimental group performed significantly better than those in control group. Also, there was no significant difference between the performance of male and female students taught using P-TLS. Based on the findings of this study it was recommended that biology teachers should employ the use of P-TLS in teaching their students. In addition, the Kaduna State Ministry of Education should conduct seminars and workshops for teachers of science-based subjects to sensitize and train them to use P-TLS.

Keywords: Peer, Tutoring, Academic, Performance, Ecology

Introduction

Education is the totality of life experiences that people acquire, and which enables them to cope with diverse situations in the world (Obodo, 2004; Ido and Abasienie, 2015). The role of science to technological development of any nation cannot be over emphasized. Economic strength of a nation is always assessed in term of its performance in science and technology (Wasagu, 1999, Olarinoye, 2001; Otuka, 2006; Anikweze, 2014). In view of its importance, the Federal Government of Nigeria emphasized the teaching of science and technology in all institutions as contained in the National Policy on Education (FRN, 2005).

Biology serves as a prerequisite to the study of medicine, pharmacy, agriculture among others. Biology concepts according to Chew (2004) can sometimes be difficult particularly when describing ideas that are abstract or cannot be fully comprehended by learners for the first time. Ecology is an aspect of the biology syllabus that senior secondary students at SS2 must study. However, it is considered as abstract in nature and difficult to understand which has resulted in poor performance among students (Danmole & Femi-Adeoye, 2004; Ido and Abasienie, 2015).

The problem of poor performance in science subjects including Biology has persisted over the years (Eguabor, 2001; Olalekan & Jerome, 2006; Enesi, 2007). This observation has evoked much research efforts aimed at evolving means of re-addressing the situation. Science education researcher like Akibuilo (2004) attributed the poor performance in science including Biology to problems such as low morale of students, poor preparation of teachers, overcrowded classroom, inadequacy of laboratory, poor attitude of students to work, gross underfunding and inadequacy of rewards for excellence in science teaching and learning. However, with all the problems associated with poor performance, efforts are being made to find solutions to the recurring failure rate among science students. One of such efforts is on the issue of instructional methods which has attracted a lot of researchers such as Ibrahim (2008); Abdullahi (2007). Teaching methods otherwise called instructional methods are many and varied. According to Nkebem and Okon (2006), teaching method is described as interplay of activities whose combined effect enhances the accomplishment of specific instructional objectives. They enumerated some commonly used teaching methods as lecture, tutorial methods. All these methods aim at enhancing teaching and learning leading to the attainment of specific instructional objectives. Predominant instructional method used in teaching at all levels of education, is through the use of lecture method. Lecture method on the other hand has been reported by Awodi (1994) and Okeke (2006), to be ineffective in science instruction. The use of lecture method entails a one-way flow of communication from the teacher to the students. It is teacher-centre or teacher dominated approach. Most of the talking is carried out by the teacher while the students remain as passive listeners taking down notes. Hence is referred to as didactic approach or talk and chalk method.

One of the methods recommended in teaching is the use of peer tutoring. According to Griffin and Grinffin (2007) peer tutoring is a teaching method in which students of the same class and the same age bracket undertake the teaching of themselves through the process whereby one student among the group teaches other students in the group as a tutor. Students function as both tutor and tutee in reciprocal peer tutoring of system of teaching.

Peer tutoring is one collaborative approach where pairs of students interact to assist each other's academic performance and retention by the student's adopting the role of tutor and the role of tutee. Recognising the benefits gained by the students from acting as tutor

Retention as the name implies is the ability to keep what is leant in memory and consequently remember them at a later time (Bichi 2002). When teaching is characterized by rote learning, meaningless memorization on verbalism, students make ineffective learning, and the facts thus learned are not long retained, nor do they seem to have much effect in changing behaviour (Akinbobola & Folashade, 2009).

Another important issue is that of the influence of gender and teaching strategies in science. Some studies (Ogunleye, 2001; Adesoji, 2008, and Bunkure, 2008) on the effects of instructional strategies on students' performance in science suggest that that there is a relationship between gender and teaching approaches. Difference in the performance of both male and female students in science subjects when exposed to various instructional strategies are reported by Okeke (2001) to be insignificant, while Oyarole and Adeola (2017) reported no significant difference between the performance among male and female students taught using S-GLS. However, some research findings such as Ezeeugo & Agwagah (2000); Mari, (2001) and Adepoju, (2009) revealed consistent differences between the performances of male and female learners in performance tasks in science. Mari (2001) reported that students' performance in science was significantly high when taught by teachers of opposite sex. The reasons researcher attribute to gender-related differences in performance between male and female learners include the innovative nature of the instructional approach used, students' ability levels, psychological and socio-cultural factors (Okeke 2006).

Annual report of examination results by West African Examination Council (2015) showed that students' performance in biology was very unsatisfying as contained in (Table 1). This is because though Biology is not a core curriculum subject in the senior secondary schools, but because of the stipulation that students must offer one of the basic science subjects, according to the new curriculum of 2013/2014 hence, it is preferred by most students. The results obtained by candidates have been abysmal and do not justify the popularity as observed by researchers (Okoye & Okeke, 2007; Gyuse, 2009). The statistics of performance in Biology May/June Senior Secondary Certificate Examination (SSCE) from 2014-2015 revealed a poor percentage score at credit level in grade 1-6.

The performances in biology within a period of 2 years have been abysmal. Despite the increasing number of candidates over the year under review, the percentages of candidates with credit pass and above are below 47% for the whole year under review. Consistent poor performance of students in Biology at SSCE leaves one in doubt about the effectiveness of the teaching method popularly used by biology teachers. The use of talk and chalks methods of teaching leads to memorization of facts and concept, which has not proven to be effective for all reasoning abilities. The use of peer tutoring strategy has been advocated by researchers, such as Njoku (2004) and Adesoji & Ibrahim (2009) that the use of peer tutoring learning strategy enhances academic performance and retention in science subjects at SS level.

Objectives of the study

The objectives of this study are to:

1. Determine effect of peer tutoring learning strategy on performance of students in ecology.
2. Investigate the effect of Peer tutoring on retention level of male and female students in ecology.

Hypotheses

The following hypotheses were formulated and tested at $p \leq 0.05$ level of significances.

1. There is no significant difference in the mean scores of students taught ecology concepts using peer tutoring learning strategy and those taught using lecture methods.
2. There is no significant difference in retention level of male and female students taught ecology concepts using peer tutoring learning strategy.

Methodology

This study adopted pretest, pottest and post-posttest quasi experimental-control group design as proposed by (Kerlinger, 1973). The study involved two groups; experimental and control groups consisting male and female students. The two groups were pre-tested to determine the equ+ivalence in ability of the student, the subjects in the experimental group were treated using peer tutoring learning strategy while the control group were taught the same concept using lecture method. At the end of the six weeks' treatment period, a posttest was administered to both groups of students to evaluate the effectiveness of the treatment in enhancing students' academic performance in Biology. The post-posttest was administered two weeks after the posttest to test for the student's retention ability as proposed by (Tuckman, 1975). The research design is presented in Figure 1

$$EG \rightarrow O_1 \rightarrow X_1 \rightarrow O_2 \rightarrow O_3$$
$$CG \rightarrow O_1 \rightarrow X_0 \rightarrow O_2 \rightarrow O_3$$

Figure1: Research Design illustration adopted from Kerlinger (1973)

Where:
EG = Experimental Group
CG = Control Group
O_1 = Pre-Test
O_2 = Post- test
O_3= Post- post-test

The population for this study constitutes all the public Senior Secondary Schools in Sabon Gari Local Government area under Zaria Zone in the Ministry of Education Science and Technology, Kaduna State. The total population of students in these schools stood at 600. In selecting the sample used for the study, the names of the six schools were written on a piece of paper and a piece of paper was picked using simple random sampling once at a time. The content was reshuffled each time a piece of paper was picked to ensure equal chance of picking each of the paper. The two schools whose names were coded on the pieces of paper picked were used as sample schools. Hence, the total number of subjects in the two schools was 60 subjects. This is

in accordance with central limit theorem Tuckman (1975) who proposed 30 as minimum sample size for an experimental study.

One instrument was tagged Ecology Performance Test (EPT) which was developed by the researcher was used to collect data for the study. The EPT is a multiple choice objective test with 5 distractors on ecology. The face and content validation (0.88) of EPT was carried out by three professionals in sciences education department, with rank of senior lecturers and Ph.D., Ahmadu Bello University, Zaria. To ascertain the reliability of EPT, test-retest method was used to statistically estimate the internally consistency of the instrument, Tuckman (1975), who proposed the minimum interval of two weeks or more interval. The result of the test was correlated using Pearson Product Moment Coefficient and reliability coefficient was found to be 0.88 which was considered reliable for the study to measure the academic performance of the subjects.

Research questions were answered using descriptive statistics; mean and standard deviation while research hypotheses were tested using independent t-test statistics at 0.05 level of significance.

Results

Hypothesis 1

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

To test the hypothesis, the posttest performance means scores of experimental and control groups were analyzed using independent t-test statistics. The result of the t-test is shown in Table 1.

Table 1: Summary of t-test Analysis for performance of Experimental and Control Groups

Group	N	Mean	SD	Df	t-value	P-value	Remark
Experimental	30	62.45	4.65				
				58	3.92	0.03	S
Control	30	60.03	3.82				

*Significant at P≤ 0.05

Table 1 shows the t-test relationship between the student academic performance in post-test score in both experimental and control group. It reveals that there is significant difference between the performance of experimental group and control group as the calculated p-value of 0.03 is lower than the 0.05 alpha level of significance. Therefore, the null hypothesis which stated that: There is no significant difference in the mean scores of students taught ecology concepts using peer tutoring learning strategy and those taught using lecture methods is therefore rejected.

Hypothesis 2

There is no significant difference in retention level of male and female students taught ecology concepts using peer tutoring learning strategy.

The $H0_2$: was analyzed using independence t-test at $p \leq 0.05$ level of significance. The result is presented in Table 2.

Table 2: Summary of t-test Analysis of Post-posttest Scores of Male and Female Students in the Experimental Group.

Group	N	Mean	SD	Df	t-value	P-value	Remark
Experimental	30	68.5	6.16	58	2.28	0.26	**
Control	30	63.54	9.45				

***Significant at P**< 0.05

Table 2. Revealed that there is no significant difference in retention of ecology concepts between male and female students in their academic scores after exposure to peer tutoring learning strategy i.e. treatment. The female and male recorded a mean of 68.50 and 63.54 respectively**.** The calculated p value of 0.26 is higher than the 0.05 alpha level of significance. Therefore, the null hypothesis which stated that there is no significant difference between retention level of male and female students exposed to peer tutoring learning strategy is hereby retained.

Discussion of Findings

The result from the research question and hypothesis one indicated that the experimental group who were taught using peer tutoring learning strategy achieved significantly better than those in the control group who were taught same using lecture method. The significant difference in student performance is in favour of the students in the experimental group who suggested a greater impact of peer tutoring learning strategy over the lecture method of teaching. This finding of this study agrees with that of Ibrahim and Omar (2006), and Oyarole and Adeola (2017) who also discovered that students using reciprocal peer tutoring together perform significantly better than those taught using lecture method. The performance of those in the peer tutoring strategy might have been engendered by the opportunity the members had to interact together, share ideas and have better grasp of concept which enhanced their performance. The result in control group showed that lecture method is not very effective in increasing academic performance. As students in lecture method are engaged as passive learners.

Hypothesis two showed that there was no significant difference in the performance of male and female when exposed to peer tutoring learning strategy. The result revealed no significant difference in the performance of male and female students as shown in table 7. This means that peer tutoring learning strategy is an instructional strategy that is gender friendly.

This findings agrees with the findings of Oyarole (2017) who reported no significant difference in the academic performance of boys than girls who were exposed to collaborative learning strategy. No significant difference between retention ability of ecology concept between male and female students exposed to peer tutoring learning strategy as revealed by the result of this study may be due to the fact that in peer tutoring learning strategy students of different ability came together to work on the same task share ideas and experiences freely. This equal opportunity for the students to learn together irrespective of their gender differences.

Conclusion

In conclusion, the findings of the study had shown that students taught ecology concepts achieved higher and had better retention when peer tutoring strategy was used as a medium of instruction for senior secondary biology students. This study also revealed that peer tutoring learning strategy is efficacious in eliminating gender related differences in science learning, indicating that the strategy is gender friendly.

Recommendations

The following recommendations were made:

1. Teachers should be advised by the ministry of education to adopt the approach in teaching biology.
2. Ministry of education Kaduna State should conduct seminars and workshops for teachers of science-based subjects to sensitize and train them to use peer tutoring learning strategy.

References

Abdullahi, A.B. (2007). Improving the Teaching Methods of Chemistry Practical. *Science Teachers Association of Nigeria, Chemistry Panel National Workshop Proceedings*, (3), 120-123.

Adepoju, T.I (2009). Mapping Strategy and Policy Initiatives for Gender Gap in Science and Technology Education in Nigeria Higher Institutions. Paper Presented at the First *International Conference of Girls and Woman in Science and Technology in Bamako. Mali*, 13-15 July, 2009.

Adesoji, F.A. (2008). Managing Students' Attitude toward Science through Problem solving Instructional Strategy. Department of Teacher Education, University of Ibadan, Nigeria. *Journal Educational Technology Research and Development, 40* (3), 21 – 38.

Ajayelemi, D.A. (1991). Alternative Teaching Strategies Science Education. Paper presented at the *Nigeria Association of Science and Education*, Research University of Lagos.

Akinbobola, A.O. & Folashade, A. (2009). Constructivist Problem based Learning Techniques and the Academic Performance of Physics Students in Nigerian Secondary School. *Eurasian Journal of Physics and Chemistry Education*, 1(1), 45-51.

Akubuilo, D.E. (2004). *The Effects of Two Cooperative Learning Models on Senior Secondary Students Learning Outcomes in Chemistry*. Unpublished Ph.D. Thesis. University of Ibadan, Ibadan.

Anikweze, C.M. (2014). Educational policies and management issues in Nigeria, presented at the *20th annual congress of Professors in Nigeria*. Held at Onyema Ugochukwu Hall, University of Uyo (town campus), Akwa Ibom State, Nigeria.

Ausubel, D.P. (1986). *Educational Psychology: A Cognitive View*. New York. Holt, Reinhart and Winson.

Awodi, S. (1994). *A Comparative Study of Teaching Science (Biology) as inquiry versus Traditional Didactic Approach in Nigeria Secondary Schools*. University Microfilms International, Michigan, U.S.A. D.E.D. Dissertation pp.606.

Bichi, S.S. (2002). Effects of Gender on Historically Enriched Curriculum on Academic Performance in Evolution Concept among Senior Secondary School Students. *Published Seminar Paper Science Education*, Department of Education, A.B.U.Zaria.

Bunkure, Y.I. (2008). *Effects of Computer Assisted Instructional Software on students' academic performance in Physic*. Unpublished M. Ed. Thesis

Chew, F.T. (2004). *Use of Analogies to Teach General Biology to Non- Biology Majors*. Retrieved from: http://.www.edt.sg\mar2004\tm3.htm

Danmole, B.T and Femi-Adeoye (2004).Effects of Concept Mapping Technique on Senior Secondary School Students Performance and Retention of Ecology. *Journal of the Science Teachers Association of Nigeria*, 39(1&2), 32-38.

Eguabor, V.O. (2001). The Need for Research into the Effectiveness of Individualized Study Programme in Nigeria Secondary Schools. *The Nigeria Teacher Today* 9(1), 7-11.

Enesi, A.O. (2007). Effects of Pedagogical Variables on Senior School Certificate English Language examination failures. Zaria. *Journal of Studies in Education, 3(2), 52-58.*

Ezeugo, N.C. & Agwah, U.N. (2000). Effects of Concept Mapping on Students Performance in Algebra Implication for Secondary Mathematics Education in the 21st century. Abbacus, *The journal of mathematics Association of Nigeria 25(1),* 1-12

Federal Ministry of Education (2005). *National Policy on Education*. Abuja: Nigerian Educational Research and Development Council. (NERDC)

Gyuse, S.E. (2009). Moving Teacher and Science Education Forward: Diagnosing Science Teachers Problems, Some Teachers Association of Nigeria (STAN). *50th Annual Conference*.

Ibrahim, T.A (2008). *Problems and Prospect of using Spacemen's and Apparatus for Effective Teaching of Biology in Secondary School*. Unpublished BSc.Ed project in the Department of Sciences Education, Bayero University Kano.

Ibrahim, T.A. and Omar, G. (2006). The Effects of Cooperative Learning Approach based on Conceptual Change Condition on Students' Understanding of Chemical Equilibrium concept. *Journal of Science Education and Technology*, 15(1), 31-46. DOI 10.1007/s10956-006-0345

Ido, C.F. and Abasienie, S.B. (2015). Challenges of Business Education in Achieving Employment Efficiency. *Journal of Qualitative Education*, 11(1): 1-7.

Kerlinger, F.N. (1973). *Foundation of Behavioural Research.* New York: Rinehart of Winston.

Mari, J.S. (2001). Gender Related Differences in Performance in Biology AmongSenoir Secondary School Students. Zaria *Journal of Studies in Education (ZJSE),* 3(2), *111-112.*

Njoku, Z.C. (2004). Effects of Guided Discovery Instructional Strategy on Science Performance of Elementary School Students in Japan. Findings from the Third International Mathematics and Science Study (TISS). *International of Journal of Instructional Media*. March 2006.

Nkebem, E.N. & Okon, H.I. (2006). "Effects of Cooperative, Competitive, and Individual use of Self Instruction Method on Learners Performance in Library Skill". *Library Philosophy and Practice*, 9(1), 1-10.

Obeka, S.S. (2010). *Current Trends in Geographical Environmental Education*. Ahmadu Bello University Press. A.B.U Zaria.

Ogunkunle, A.R. & Gbamaja T.S.P. (2006). Constructivism: An Instructional Strategy for Sustaining Students' Self Concept in Senior Secondary Mathematics. *Journal of the Science Teachers Asssociation of Nigeria* 4(4), 87-99.

Ogunleye, A.O. (2001): *Science Education in Nigeria Historical Development Curriculum Reforms and Research.* Sunshine International Publication (Nig) Ltd.

Okeke Z.O. (2006). Woman in Science, Technology and Mathematics Education in Nigeria. *A keynote Address at 42nd Annual Conference Proceeding*.

Okoye, B. E. and Okeke, D.C. (2007). Efficacy of Eliminating Superstitious Beliefs Strategy in Performance and Knowledge for Retention in Genetics among Secondary School Students. *Journal of the Science Teachers Association of Nigeria*, 42(1&2), 73-77.

Olalekan, M.N. and Jerome, S.I. (2006). Strategies for Enhancing the Teaching and Learning of Mathematics.*Journal of Educational Research and Policies, 1(1)*, 57-61.

Olarinoye, R.D. (2001). Science Education as a Basis for Technological Development. A lead paper Presented at *1st National Conference of Federal College of Education*, (Technical) Gombe, Gombe State. Pp14-19.

Ormrod, J.E. (2000). Educational Psychology: *Developing Learners*. Upper Saddle River, Jersey: PreoticeItall, Inc.

Otuka, J.E. (2006). The Teacher as a Key National Development and Technological Breakthrough. A Lead paper Presented at *a National Conference Organized by School of Science*, Federal College of Education, Zaria, Kaduna State, 4th-7th April.

Oyarole, Y.A. and Adeola, A.D. (2017). Impact of Small-Group Learning Strategy on Performance and Retention in Ecology among Senior Secondary School Students in Gusau, Zamfara State, Nigeria. *ATBU, Journal of Science, Technology & Education (JOSTE), 5 (3),* 137-147.

Oyedokun, M.R. (2002). Identification of Difficult Topics in the Senior Secondary School Certificate Biology Syllabus as Perceived by Students. *The Nigerian Teacher Today, 10(1),* 110-120.

Tuckman, B.W. (1975). *Measuring Education Outcomes*. Handout Huvawick, New York.

Wasagu, M.A. (1999). The Relationship between Science Students Cultural Belief and their Academic Performance at the Secondary School level in Sokoto State. *Journal of the Science Teachers Association of Nigeria,* 34(1&2), 27-32.

West African Examinations Council (2012). *Chief Examiners Report*. May/June.

West African Examinations Council (2015). *Chief Examiners Report*. March.