

To cite this article: Kamal Ahmad MUAZ and Dr. Mohammed Abel Ali (2024). EFFECTS OF PEER TUTORING INSTRUCTIONAL STRATEGY ON SECONDARY SCHOOL BIOLOGY STUDENTS' ACADEMIC ACHIEVEMENT AND INTEREST IN RINGIM EDUCATION ZONE, JIGAWA STATE, NIGERIA, International Journal of Education and Social Science Research (IJESSR) 7 (2): 115-126 Article No. 913, Sub Id 1418

EFFECTS OF PEER TUTORING INSTRUCTIONAL STRATEGY ON SECONDARY SCHOOL BIOLOGY STUDENTS' ACADEMIC ACHIEVEMENT AND INTEREST IN RINGIM EDUCATION ZONE, JIGAWA STATE, NIGERIA

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ABSTRACT

This study investigated the effects of peer tutoring Instructional strategy on secondary school Biology students' academic achievement and interest in Ringim Education Zone, Jigawa State, Nigeria. Two research questions were raised and two null hypotheses guided the study, this study adopted a quasi-experimental pretest, and posttest, experimental and control group design. The study comprises a population of 4,740 SS II biology students in the 28 public senior secondary schools in Ringim Education Zone. Purposive sampling technique was used to select two co-educational schools which comprised of 64 students as the sampled from two intact classes of the two selected schools (29 students for experimental group and 35 students for control group). Biology Achievement Test (BAT) was used to collect the data. Reliability coefficient of BAT was 0.72 and reliability index of Biology Students Interest Questionnaire was 0.81 using the Cronbach's Alpha method. The data were analyzed using descriptive statistics (mean and standard deviation) for answering research questions and inferential statistics (ANCOVA) for testing the null hypotheses. The result revealed that biology students in experimental group taught Digestive system using peer tutoring method have higher mean achievement than those taught using conventional method, also Female biology students have higher achievement scores than their male counterpart in Digestive system when taught using peer tutoring method than those taught using conventional method. The findings also indicated that biology students taught Digestive system using peer tutoring strategy in the experimental group have higher mean interest scores than those in the control group taught using conventional method. Based on the findings of the study it was recommended that secondary school biology teachers in Ringim Education Zone should expose their students to peer tutoring learning strategy in order to improve their academic achievement and interest in learning Biology.

KEYWORDS: Peer Tutoring Instructional Strategy, Conventional Method, Academic Achievement, Interest and Gender

INTRODUCTION

Science is a process geared towards problem solving to enhance the living standard of man. Taber (2009) defines science as a complex human activity that leads to the production of a body of universal

statement called laws, theories or hypotheses, which serve to explain the observable behavior of the universe or part of it, which, in themselves, have predictive characteristics. Science has been defined as a systematic enterprise of gathering knowledge about the world, organizing and condensing that knowledge into testable laws and theories (Hornby, 2010). Science education is the field concerned with sharing science content and process with individuals not traditionally considered part of the scientific community. The importance of science education to nation building cannot be over emphasized, the Federal Government of Nigeria emphasized the teaching of science and technology at all levels of education in the country, (Ezeh, 2013, & FRN, 2013). Nwagbo and Ovute (2011) asserted that Science and technology education are the foundation of sustainable national development, by protecting human societies from ignorance, illiteracy, diseases and poverty. it is also defined as the study of science subjects (chemistry, physics and Biology) with effective teaching methods in order to share knowledge to individuals or community (Aina, 2013). Nested within science education are sub fields that includes Education Physics, Education Chemistry and Education Biology.

Biology as a branch of science that is concerned with the characteristics and behavior of organism how species and individual come into existence, and the interaction they have with their environment. Umeh (2010); Neteiyin (2012) and Abubakar (2012) have observed that, Biology as a discipline has contributed tremendously to financial, physical, and aesthetic benefits of humanity and to the nation building. However, recently students' academic performance in Biology in WAEC (From 2014-2018) revealed that a few numbers of students perform better. According to Adesoji and Offiah (2013), poor teaching methods such as lecture method used by secondary school teachers have been found to contribute to poor performance in biology. Similarly, Aniodoh (2015) pointed that lecture methods may be ineffective instructional approaches to be used in biology because it does not encourage active learning but only help intellectual passivity and weariness of the learners. Therefore, there is need to utilized new strategies of teaching that are students centered such as peer tutoring learning strategy.

Peer tutoring as an instructional strategy in which students work in pair form to learn academic tasks in the class. Usually, shy children learn effectively through tutoring by sharing their thoughts with classmates, (Scruggs, Mastropieri & Marshak, 2012; Bombardelli,2016). Peer interaction among children is useful in learning new skills, knowledge, and solutions to each other's problems by playing, talking, quarrelling and sharing ideas, (Austin,2008). The teacher therefore acts as a facilitator and guides, making it possible for the learner to reach mutually agreed upon Goals. The teacher serves as a resource person to stimulate, motivate, clarify, and explain. The Idea is that students are likely to remember concepts they interact. Therefore, peer tutoring learning strategy enhance students' academic achievement. Sambo, Idris, Olayinka and Sabo (2022) showed that the peer tutoring performs better than the control group. Similarly, Kalu-Uche and Ogbonna (2021) found that significant differences exist between slow learners taught using the class wide peer tutoring strategy and those taught using the conventional teacher-led discussion strategy. In the same

vein, Sambo, Idris, Olayinka and Sabo (2022) showed that males in the peer tutoring achieved higher mean scores (Mean=31.89) than those in the control group (Mean=23.55.9). Ngozi (2022) revealed that the slow learners in the peer tutoring achieved better in Biology than the slow learners in the control Group.

Academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university (Anja 2014). This implies that knowledge development and knowledge development can be guaranteed when effective teaching method is used in the teaching and learning process and thus, students are able to internalize what has been taught, and all these were achieved when students have positive interest towards the teaching and learning process (Wushishi, 2013).

Interest in science can be described as a more concrete level in secondary schools. In the first case, the content area of science interest would comprise the whole body of science-related subjects and topics of which a person is aware. In the second, an individual science interest can be limited to school subject or to topics and activities within a subject (McCrae, 2011). Nworgu (2009) described interest as the attraction which forces or compels a student to respond to stimulus. It points out the fact that, student develops interest if a particular stimulus is attractive and arousing or stimulating. Ngozi (2022) found that there was no significant difference in the mean interest and achievement scores of slow learners taught in the peer tutoring and those taught in the control group. Ngozi (2022) revealed that there was no significant difference in the achievement and interest of male and female slow learners taught in the peer tutoring and those taught in the control group. Therefore, this study intends to examine the effect of peer tutoring instructional strategy on secondary school biology students' academic achievement and interest in Ringim Education Zone, Jigawa State, Nigeria.

STATEMENT OF THE PROBLEM

Despite the importance of Biology among Nigerian students, performance at senior secondary school level has been poor when compared with the number of enrolments with the number at credit level; the persistent poor performance in biology in senior school certificate examination by secondary school students is causing some concern among biology teachers, school administrators, parents and the general public. Research studies like Ibe and Maduabum (2011), Ahmad & Abimbola (2011) have shown low performance of students in internal and external examinations, the percentage number of students who passed the credit and above has continue to fluctuate, and have not increase as expected (See Table 1).

Table 1. shows the level of Academic achievement in SSCE Examination (Biology) in Jigawa State from 2017-2021

Table 1: WAEC Examination showing Biology results from 2017-2021

| Year | Total No. of students registered | No of students with credit and above | No of student with less than credit | % of students with credit and above | % of student with less than credit |
|------|----------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|------------------------------------|
| 2017 | 9769 | 3345 | 6424 | 34.25 | 65.75 |
| 2018 | 11,869 | 3673 | 8196 | 30.95 | 69.05 |
| 2019 | 14,740 | 5741 | 8999 | 38.95 | 61.05 |
| 2020 | 15,860 | 7273 | 8587 | 45.86 | 54.14 |
| 2021 | 17,575 | 13,457 | 4118 | 76.57 | 23.43 |

Source: Jigawa State Education Resource Department (J.E.R.D), Dutse,2021.

Purpose of the Study

The main objective of this study is to investigate the effect of peer tutoring instructional strategy on students` academic achievement and interest in biology. Specifically, the study seeks to.

1. Determine the academic achievements of students taught biology using peer tutoring instructional strategy and those taught using conventional method.
2. Examine the effects of peer tutoring instructional strategy on students` interest towards Biology.

Research Questions

This study was guided by the following research questions:

1. What are the mean academic achievement scores of students taught biology using peer tutoring instructional strategy and those taught using conventional method?
2. What is the mean interest score of students taught Biology using Peer tutoring instructional strategy and those taught using conventional method?

Hypotheses

The following null hypotheses guided the study.

H01: There is no significant difference between the mean academic achievement scores of students taught biology using peer tutoring instructional strategy and those taught using conventional method.

H02: There is no significant difference between the mean interest scores of students taught Biology using peer tutoring instructional strategy and those taught using conventional method.

Theoretical Framework

The theory of constructivism was developed by John Dewey in the 1920's and 1930's, which proposed that learning occurs through experience. Constructivism is a philosophy about learning proposes that, learners build their own understanding of new ideas during teaching and learning. It is one of the important educational theories interested in arousing the learners thinking and makes students to become active, interactive, and positive during the learning process. It emphasizes the fact that education is an active process towards building knowledge, and concentrates on the internal factors

affecting the learners and what occurs to them when faced with educational situations like previous knowledge, understanding concept, ability to remember and process information, learning drive, thinking pattern and anything makes the learning meaningful (Ahmad,2012).

Another theory that is relevant to this study is Walberg Theory of academic achievement was developed by Walberg, (1981). It is also known as theory of educational productivity and was empirically tested as one of very few theories of academic achievement. Walberg theory of academic achievement speculates that psychological characteristics of individual students and their immediate psychological environment influence educational outcomes (cognitive, behaviour and attitude). Further Walberg identified nine key variable that influence educational outcomes as student's ability or prior achievement, motivation, age and developmental level, quantity instruction, quality of instruction, classroom climate, home environment, peer group, and exposure to mass media outside of school, (Walberg, Fraser, & Welch, 1986). The first three variables (ability, motivation, & age) reflect characteristics of the students, the fourth and fifth variables reflect instruction (quality and quantity), and the final four variables (classroom climate, home environment, peer group & exposure to mass media) represent aspect of the psychological environment (Fraser, Walberg Welch, & Hattie, 1987). Clearly, students' characteristics are important for school learning and were the set of proximal variables with the most significant impact on learner outcomes. The Walberg theory was used as a guide to this study because of the identified key variables that could increase students' achievement, such variables include prior achievement, age, instructional quality and quantity, classroom climate among others were mentioned in the steps of Peer tutoring such as set induction, explanation, discussion, ask questions, answer question steps consideration when designing and delivering teaching and learning of biology using Peer tutoring Instructional strategy.

LITERATURE REVIEWED

The study reviewed many literatures upon which it contains the theoretical framework, conceptual framework and the review of related studies which reviewed theories and other concept related to the study, these include concepts of Biology and Biology education conventional method of teaching, Peer tutoring learning method, student's achievement in biology, Interest. The study was guided by constructivism theory (1920-1930s), Walberg theory of academic achievement (1981). The review has shown the objectives of biology education in the curriculum to Nigerian schools when achieved would help students with the knowledge and status of their biological world. Teacher's use of conventional method of teaching in teaching and learning of biology in secondary schools, may resulted in poor achievement for students, and may cause students to develop negative interest towards the subject. Research studies revealed that Romano and Walker (2010) indicated that peer tutoring instructional strategy helped students achieve greater understanding of biology and helped them become more successful in completing biology tasks. Similarly, Nworgu and Ezenwosu (2013) 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, peer tutoring had more significant 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. This findings 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 teacher, students may comprehend biological 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. This implies that it also provides small group, intense, focused, individualized instruction that fosters creativity, self-confidence, development of problem solving skills, and active interaction among students and may improve their academic achievement.

METHODOLOGY

The area of this study was Ringim Education Zone of Jigawa State Nigeria. The study adopted Quasi-experimental design involving pre-test and post-test control group design. The population of the study was 4740 which comprises of 2495 female and 2245 male students from 28 senior secondary school that are offering Biology in Ringim Education Zone. The study used two intact classes from the selected schools, which make the sample size of two intact classes of sixty-four (64) students (29 students for experimental group and 35 students for control group). Purposive sampling technique was used to select one intact class from sample schools making a total of two intact classes of SSII Biology students. Two instruments were used in this study for data collection, which are: Biology Achievement Test (BAT) and Biology Students Interest Questionnaire (BSIQ). The instrument was subjected to both content and face validation by three experts from the Department of Science and Technology Education, Bayero University, Kano. The reliability coefficient for the BAT was found using the Pearson's Product Moment Correlation Coefficient (PPMC) to be 0.72 and that of the BSIQ was found using Cronbach's Alpha which is 0.81. The data collected were subjected to analysis at two different levels, via; descriptive and inferential statistics levels. The research questions were answered using the descriptive statistics of frequency mean and standard deviation while, the research hypotheses were tested using inferential statistics of Analysis of Covariance (ANCOVA) for both achievements and interest at alpha value 0.05 % level of significance.

RESULTS

Research Question One: What is the mean academic achievement score of students taught biology using peer tutoring instructional strategy and those taught using conventional method?

Table 2: Mean Achievement Scores of Biology Students Taught Using Peer Tutoring Instructional Strategy and Those Taught Using Conventional Method.

| Group | N | Mean (\bar{x}) | S.D | M.D | Std Error Mean | Remark |
|--------------|----|--------------------|------|------|----------------|--|
| Control | 35 | 18.68 | 4.15 | 5.25 | .70 | Difference exist in favour of Exp. group |
| Experimental | 29 | 23.93 | 3.64 | | .68 | |
| Total | 64 | | | | | |

Table 2 shows that the control groups has a mean score of 18.68 and standard deviation of 4.15, while the experimental group has the mean score of 23.93 and standard deviation of 3.64, and a mean difference between the two groups is of 5.25. This shows that Biology students taught using peer tutoring instructional strategy have higher mean achievement scores than those taught using conventional method. The standard deviation shows that the response of control group (SD = 4.15) was closely around the mean when compared to the response of experimental group (SD = 3.64).

Hypothesis One: There is no significant difference between the mean academic achievement scores of students taught biology using peer tutoring instructional strategy and those taught using conventional method.

Table 3: ANCOVA test for the Post Test Achievement Scores of Biology Students Taught Using Peer Tutoring Instructional Strategy and Conventional Method.

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared | Decision |
|-----------------|-------------------------|----|-------------|--------|------|---------------------|----------|
| Corrected Model | 616.724 ^a | 2 | 308.362 | 24.208 | .000 | .442 | Rejected |
| Intercept | 260.949 | 1 | 260.949 | 20.486 | .000 | .251 | |
| Pretest | 180.379 | 1 | 180.379 | 14.161 | .000 | .188 | |
| Group | 341.062 | 1 | 341.062 | 26.775 | .000 | .305 | |
| Error | 777.026 | 61 | 12.738 | | | | |
| Total | 29786.000 | 64 | | | | | |
| Corrected Total | 1393.750 | 63 | | | | | |

a. R Squared = .442 (Adjusted R Squared = .424)

ANCOVA Tests result in Table 3 reveals that there is a significant difference in the mean achievement scores of biology students taught biology using peer tutoring method and those taught using conventional method of teaching in favor of those taught using the peer tutoring method. $F=26.775$ and $P=0.000 < 0.05$, the null hypothesis is therefore rejected. This implies that peer tutoring method of teaching is more effective than the conventional method ($f\text{-cal} = 26.775, p = 0.000 < 0.05$).

Research Question Two: What is the mean interest score of students taught Biology using Peer tutoring instructional strategy and those taught using Conventional method?

Table 4: Mean Interest Scores of Biology Students Taught Using Peer Tutoring Instructional Strategy and Those Taught Using Conventional Method.

| Group | N | Mean (\bar{x}) | S. D | M.D | Std Error Mean | Remark |
|--------------|----|--------------------|------|------|----------------|---|
| Control | 35 | 60.97 | 9.46 | 7.44 | 1.59 | Difference exist in favour of exp group |
| Experimental | 29 | 68.41 | 7.83 | | 1.46 | |
| Total | 64 | | | | | |

Table 4 shows the mean interest scores between control group (those taught using conventional method) and the experimental group (those taught using peer tutoring instructional strategy) the mean interest scores and standard deviation of control group are 60.97 and 9.46 respectively, while the mean interest scores and the standard deviation of the experimental group are 68.41 and 7.83 respectively. The mean difference between the two groups is 7.44. This means that students taught biology using peering tutoring instructional strategy had more interest scores than those taught using conventional method. The standard deviation of experimental group (SD = 7.83) were closely around the mean than that of control group (SD = 9.46).

Hypothesis Two: There is no significant difference between the mean interest scores of students taught Biology using peer tutoring instructional strategy and those taught using conventional method.

Table 5: ANCOVA Test for Interest Scores of Students Taught Using Peer Tutoring Instructional Strategy and Those Taught Using Conventional Method.

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared | Decision |
|-----------------|-------------------------|----|-------------|--------|------|---------------------|----------|
| Corrected Model | 887.234 ^a | 2 | 443.617 | 5.698 | .005 | .157 | Rejected |
| Intercept | 1871.728 | 1 | 1871.728 | 24.041 | .000 | .283 | |
| Pre-test_int | 8.803 | 1 | 8.803 | .113 | .738 | .002 | |
| Group | 886.945 | 1 | 886.945 | 11.392 | .001 | .157 | |
| Error | 4749.203 | 61 | 77.856 | | | | |
| Total | 270604.000 | 64 | | | | | |
| Corrected Total | 5636.438 | 63 | | | | | |

a. R Squared = .157 (Adjusted R Squared = .130)

Table 5 revealed the ANCOVA test for the mean interest scores for control and experimental groups. The observed p-value is 0.001 which is less than the significance p-value 0.05. The null hypothesis is here by rejected because the observed p-value is less than the significance p-value 0.05. Therefore, there is significant difference between the mean interest scores of the secondary school biology

students taught using peer tutoring instructional strategy and conventional method ($f\text{-cal} = 11.392, p = 0.001 < 0.05$).

Finds of the Study

1. There is a significant difference in the mean achievement scores of biology students taught biology using peer tutoring method and those taught using conventional method.
2. There is significant difference between the mean interest scores of the secondary school biology students taught using peer tutoring instructional strategy and conventional method

DISCUSSION OF FINDINGS

The present study investigated the effect of peer tutoring instructional strategy on secondary schools' students' academic achievement and interest in Biology in Ringim Education Zone Jigawa State, Nigeria. Two groups were involved in the study assigned into experimental and control group and their equivalent was determined using pre-test and post-test. The students in the experimental group were taught using peer tutoring instructional strategy and those in the Control groups were taught using Conventional method. Two research questions with their corresponding null hypotheses were answered and tested and the results obtained are discussed as.

The results from research question one and hypotheses one presented in Tables 2 and 3 indicate that the mean achievements score of students taught Biology using peer tutoring instructional strategy is higher than those taught using conventional method with grand mean score of 23.93 in experimental group against 18.68 in control group. And there is a significant difference in the mean achievement scores of biology students taught biology using peer tutoring method and those taught using conventional method. These results agreed with Sambo, Idris, Olayinka and Sabo (2022) showed that the peer tutoring (Mean=31.6) perform better than the control group (Mean=24.9). Kalu-Uche and Ogbonna (2021) indicate that significant differences exist between slow learners taught using the class wide peer tutoring strategy and those taught using the conventional teacher-led discussion strategy. Ngozi (2022) revealed that the slow learners in the peer tutoring achieved better in Biology than the slow learners in the Control Group. In the same vein, Sambo, Idris, Olayinka and Sabo (2022) showed that males in the peer tutoring achieved higher mean scores (Mean=31.89) than those in the control group (Mean=23.55.9). Similarly, Sambo, Idris, Olayinka and Sabo (2022) indicated that female students taught using peer tutoring ($M = 31.34$) perform better than those taught using the lecture method ($M = 26.64$)

The result of research question two and hypothesis two analyzed and presented in Tables 4 and 5 also indicate that the mean interest scores of experimental group taught using peer tutoring instructional strategy is higher than those taught Biology using conventional method with grand mean interest scores of 68.41 and the standard deviation of 7.83 against 60.97 and 9.46 respectively in control group with the mean difference of 7.44 and there is significant difference between the mean interest scores of the secondary school biology students taught using peer tutoring instructional strategy and conventional

method. This finding disagreed with Ngozi (2022) found that there was no significant difference in the mean interest and achievement scores of Slow Learners taught in the peer tutoring and those taught in the control group. Ngozi (2022) revealed that there was no significant difference in the achievement and interest of male and female slow learners taught in the peer tutoring and those taught in the control group.

CONCLUSION

The following conclusions were drawn from the findings of the study that peer tutoring instructional strategy improves students' academic achievement in Biology than the conventional method. Students taught Biology using peer tutoring instructional strategy had higher more interest in learning Biology than those taught using conventional method.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

1. Secondary schools Biology teachers in Ringim Educational Zone should expose their students to peer tutoring instructional strategy in order to improve the students' academic achievement.
2. For better arousing of interest in Biology, teachers should integrate use of peer tutoring instructional strategy to supplements the conventional method of teaching.

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