



EFFECT OF PEER ASSESSMENT ON SECONDARY SCHOOL BIOLOGY STUDENTS' ACHIEVEMENT IN KOKONA LOCAL GOVERNMENT AREA OF NASARAWA STATE NIGERIA

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Abstract

The study investigated the effect of peer assessment strategy on senior secondary school Biology students' achievement. Two research questions and two hypotheses guided the study. The study used quasi-experimental research design. The population comprised 6,638 (4,320 male and 2318 female) SS 2 students from 15 public senior secondary schools. A sample of 195 (111 male and 84 female) SS 2 students were selected for the study using stratified sampling technique. Biology Achievement Test (BAT) was developed and was used for data collection. The instruments was validated by expert and yielded logical validity index of 0.85 and reliability coefficient index of 0.88 through Kuder-Richardson 21 Formula. Descriptive statistics of mean and standard deviation was used to answers research questions while Analysis of Covariance (ANCOVA) statistics was used for testing the hypotheses one and two at 0.05 level of significance. The findings revealed that there is a significant difference in the Biology achievement mean scores of students exposed to peer-Assessment strategy. Based on the findings of this study, it was concluded that peer assessment strategy has been found to have a positive effect on students' achievement. It was recommended that Teachers should incorporate peer assessment strategy into their teaching and learning.

Keywords: Achievement, Conventional Method, Effect, Gender and Peer Assessment

Introduction

Education is regarded as a veritable instrument for the achievements of national goals. It is fundamental to the development of every nation, and to a large extent, dictates the likely pattern of the other sectors while at the same time providing an insight into the nation's future (National Policy on Education, Federal Republic of Nigeria, FRN, 2015). Education helps to develop individuals physically, mentally, socially and technologically to enable him to function effectively in any environment in which he may find himself. No nation can afford

to pay lip service to the education of its people; therefore, various societies put a lot of capital on it to ensure that the entire generation acquires the necessary skills, knowledge and the desired attitudes critical for future survival (FRN, 2015).

Naturally, the relevance of any school subject in the educational system is primarily based on its potentials in achieving the overall goals of education of that society. This is largely so because both the goals of education and those of the various school subjects are derived from the needs, problems and aspirations of the wider society. Biology is one of the core school subjects at the basic education level in Nigeria which is expected to contribute significantly to national development if effectively taught (FRN, 2015). Biology as a science deal with the study of living things. It occupies a unique position in the secondary school educational curriculum because of its importance as science of life. It is one of the most popular sciences offered by both science-oriented and art-based students in the senior secondary certificate examination in Nigeria. Biology as a subject taught in secondary schools caters on the needs of a learner who may pursue studies in the subject and its related disciplines. Biological knowledge can be applied in general improvement of man's wellbeing as evident in medicine, agriculture and industry. Biology is one of the subjects that is taken very serious in the school system, irrespective of country or level of education.

Poor academic achievement of learners in Biology can be linked to poor teachers' achievement in terms of accomplishing the teaching task. Negative attitude to work and poor teaching habits which have attributed to poor motivation. Hence, this consequently calls for an appraisal of the assessment methods employed by the biology teachers in the teaching learning process. The researcher however feels that the conventional assessment method (teacher assessment) could be a contributing factor to the students' poor achievement in biology in Nigeria secondary schools. Teacher assessment is mainly used in marking of students' exercise books and examination papers. Students are not involved in such assessment and some of them hardly see each other's marked work which would have helped them to learn from and support each other in biology. In view of this, there is need for more practical and innovative approach to teaching and evaluation which can allow learners the opportunity to participate actively in classroom activities. This calls for peer assessment technique which could serve as a guide to a faster evaluation in the teaching and learning of biology.

Despite the noble objectives of senior Secondary (SS) Biology, the academic achievements of students at the Senior Secondary Certificate Examinations (SSCE) continue to decline in Nasarawa state. This is evident in the dismal academic achievement recorded in Biology by students who wrote the year 2023 SSCE conducted by the West Africa Examination Council (WAEC). The result, when compared to that of the previous two years, shows a marginal decline in the performance of candidates. The poor academic achievement among students is a thing of worry to relevant stakeholders such as parents, teachers and students in Senior Secondary Education in Nasarawa State, Nigeria. In order to enhance better learning and understanding of the basic concept of Biology by the students, appropriate teaching strategies which must be student-centred need to be employed. One of the strategies being suggested in this study is the peer-assessment strategy.

Peer-assessment strategy is the process whereby students grade assignments or tests, of their mates or peers based on a teacher's benchmarks. Peer assessment is a form of assessment where students of the same class and subject are given the opportunity to be

involved in assessing their own learning outcomes. It is effective in a supportive learning environment in the classroom. Students must feel comfortable and trust one another in order to provide honest and constructive feedback because they were selected to different groups (the low-achieving students mixed with the high-achieving students). This allows them to become more comfortable with each other and this may lead to better peer feedback. In introducing peer assessment strategy, the teacher would ensure that students become aware of the benefits for them because they need to see the value for themselves rather than the gains for their teachers. Race cited in Alade and Olagunju (2015) stated that peer-assessment strategy encourages deep learning by the students; helps in developing clearer assessment criteria, it is a good way to generate timely feed-back; and it may also lead to improvement in students' other assessment practices which will lead to high achievement in the students' performance in the subjects.

Juwah (2015) opined that peer-assessment and peer-learning were effective and efficient in ensuring the development of the desired knowledge, skill and capabilities that faculty required. Juwah (2015) further emphasized that for peer-assessment to be effective, rigorous and appropriate training must be provided to enable the participants familiarize themselves with the process of grading their peers' assignments to meet the teacher's benchmark so that more knowledge would be gained by the student on the subject's contents. Orsmond (2015) observed that the disadvantages are encountered when students lack the ability to evaluate each other, do not take the assessment seriously, or fear discrimination.

Gender is a prominent variable in our schools especially in Nigeria. Gender refers to the socially, culturally constructed characteristics roles which are ascribed to male and female in any society. Okeke (2018) defined gender as a socially constructed concept based on the assumed position that a group of humans should possess. Gender studies are popular in Biology, this is because many have suggested that the stereotypically masculine content of Biology word problems could account for some of the gender disparities in success on such objects, but Afonja (2015) opined that no evidence to support this theory. The influence of gender in students' academic achievement has been a major concern to educational researchers for long, yet no consistent result has emerged. Udofia (2019) reported that gender had no significant influence on achievement, while Muhammad and Ibrahim (2014) reported otherwise.

Mawak and Odulum (2023) observed that, peer assessment strategy had significant effect on the achievement of students in Mathematics. A significant difference exists in the achievement mean scores of students exposed to peer assessment strategy and those not exposed to it. Also Bashir (2022) found out that, peer assessment strategy has significant effect on the academic achievement of students in Mathematics, significant difference exists in the mean achievement scores of students exposed to peer assessment strategy and those with teacher assessment technique in Mathematics, no significant difference in the mean achievement scores of male and female students exposed to peer assessment strategy in Mathematics. In the same vein, Bokolo and Joe (2021) observed that, there is a significant difference in achievement of students in peer-assessment strategy. Okeke, Basil and Catherine (2023) found out that, there is significant difference in the mean academic achievement scores of male and female students assessed in graph contents in Economics with self-assessment technique and those assessed with peer assessment technique. Omaka and Osuafor (2020) that students exposed to peer assessment technique performed better than

those exposed to teacher assessment technique and that male students had a greater mean score than their female counterpart when exposed to both assessment technique. Similarly, Udechukwu (2020) found out that, student in peer-assessment groups performed significantly better than those in the self-assessment group, even after controlling for the pretest while Alade and Olagunju (2015) observed that there is significant difference in the mean achievement scores of students taught with Peer-Assessment Strategy while there is no significant difference in the mean achievement scores of students taught without Peer-Assessment Strategy.

Frequent failure of Nigerian students in Biology subject has been the concerned of all stakeholders in Education industry. One of the major problems identified is poor assessment strategy adopted by many Biology teachers in secondary schools. The assessment and mode of teaching in some secondary schools seem to be teacher centered approaches which might not give the students the opportunity to be creative and independent in solving problems in Biology and in assessing one another in terms of their strengths and weaknesses. Teacher-centered approach may appear to have contributed to poor results in public examinations such as the Senior Secondary Certificate Examinations (SSCE). According to WAEC (2023) less than 33 percent of the students who sat for SSCE in Nasarawa State in the last three years (2021-2023) passed Biology at credit level. This has posed great concern to many education stakeholders over the years.

Perhaps an assessment strategy like peer assessment could be of help as it encourages students' active participation in their own learning and motivates students' learning. Thus, the researcher intends to find out the problems militating against effective teaching and learning of Biology in our secondary schools. This situation prompted the researcher to suggest peer-assessment strategy as one of the teaching and assessment strategy to be adopted. Thus, the questions which readily come to mind are: Would the mean achievement scores of Biology students exposed to peer assessment strategy be improved? Would gender of students affect their academic achievement in Biology? The thrust of this study evolved answers for these questions.

Research Questions

The following research questions guided the study:

1. Is there a different in the mean achievement scores in Biology between students exposed to peer-assessment strategy and those not exposed?
2. Is there a different in the mean achievement scores in Biology between the male and female students exposed to peer assessment intervention?

Statement of the Hypotheses

The following null hypotheses were tested at 0.05 alpha level:

- H₀₁:** There is no significant difference in the mean achievement scores of Senior Secondary School Biology students exposed to peer assessment strategy and of those exposed to conventional assessment.
- H₀₂:** There is no significant difference in the mean achievement scores of male and female Senior Secondary School students exposed to peer assessment strategy.

Methodology

The study used quasi-experimental research design involving the non-randomized pretest, posttest, control group design. The study investigated the effect of peer assessment strategy on senior secondary school Biology students' achievement in Kokona Local Government Area of Nasarawa State. Two research questions and two hypotheses guided the study. The population comprised 6,638 (4,320 male and 2318 female) SS 2 students offering Biology from 10 public senior secondary schools in Kokona Local Government Area of Nasarawa State for the 2024/2025 academics session. A sample of 195 (111 male and 84 female) SS 2 Biology students from two senior secondary schools was selected for the study using stratified sampling technique. Biology Achievement Test (BAT) was developed and was used for data collection. The instruments was validated by expert and yielded logical validity index of 0.85 for BAT and reliability coefficient index of 0.88 through Kuder-Richardson 21 Formula for BAT respectively. Descriptive statistics of mean and standard deviation was used to answers research questions while Analysis of Covariance (ANCOVA) statistics was used for testing the hypotheses 1-2 at 0.05 level of significance.

Results

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

Research Question 1: Is there a different in the mean achievement scores in Biology between students exposed to peer-assessment strategy and those not exposed?

Table 1: The BAT Mean scores and Standard Deviation of Students in Experimental and Conventional Groups

Groups	N	Pretest		Posttest	
		Mean	SD	Mean	SD
Experimental Group	125	41.46	9.04	73.88	12.69
Conventional Group	70	30.87	8.08	41.41	8.90

Table 1 reveals the pre-test and post-test achievement mean score of students in the experimental and control groups. From the result, students who were exposed to peer assessment had a post-test mean score (= 73.88) higher than the pre-test mean score (=41.46) with a mean gain of 32.42, indicating that there was improvement in the achievement of students after treatment. Also, for the students who were not exposed to peer assessment, the mean score was 30.87 and a standard deviation of 8.08 at the pre-test. However, in the post-test the mean score of students rose to 41.41 with a standard deviation of 8.90. The results showed that students in the experimental group had a higher mean score of (73.88) after treatment using peer assessment than those in the control group (41.41) who were not given treatment with a mean difference of 21.88. This implies that peer assessment improves Biology students' achievement more than conventional method.

Research Question 2: Is there a different in the mean achievement scores in Biology between the male and female students exposed to peer assessment intervention?

Table 2: The BAT Mean scores and Standard Deviation of Male and Female Students in Experimental Group

Gender	N	Mean	Standard Deviation
Male	111	74.75	10.87
Female	84	73.10	14.27

Table 2 shows the result of achievement mean scores of male and female students in the experimental group in Biology. The mean scores for male yielded (= 74.75) and female (= 73.10) with a mean difference of 1.65. This implies that female students performed better than male students.

Testing of the Hypothesis

Hypothesis 1: There is no significant difference in the mean achievement scores of Senior Secondary School Biology Students exposed to peer-assessment strategy and of those exposed to conventional method in Kokona Local Government Area of Nasarawa State?

Table 3: Summary of ANCOVA for Students' Achievement Scores in BAT in Experimental and Conventional Groups

Source of Variation	Type III Sum of Squares	Df	Mean Square	F	Sig
Corrected model	29736.950a	2	14868.475	108.881	0.000
Intercept	17047.005	1	17047.005	124.834	0.000
Pretest	252.275	1	252.275	1.847	0.177
Groups	19529.937	1	19529.937	143.017	0.000
Error	15977.175	193	136.557		
Total	440741.000	195			
Corrected Total	45714.125	194			

a. R Squared = 650 (Adjusted R Squared = 64.5)

Table 3 shows ANOVA test for significant difference in the mean achievement score of students exposed to peer-assessment strategy and of those exposed to conventional method. At $df = 1, 193$, $F = 143.017$, $p = 0.000$ ($p < 0.05$). This indicated that significant level is less than Alpha level ($p < 0.05$). This suggested a statistically significant difference in the mean achievement score of students exposed to peer-assessment strategy and of those exposed to conventional method. Thus, the null hypothesis one is rejected hence, there is a significant difference in the mean achievement score of students in the experimental and those in the control group.

Hypothesis 2: There is no significant difference in the mean achievement scores of male and female Senior Secondary School Biology Students exposed to peer-assessment strategy in Kokona Local Government Area of Nasarawa State?

Table 4: ANCOVA Result on Achievement of Experimental Group in Biology based on Gender

Source of Variation	Type III Sum of Squares	Df	Mean Square	F	Sig
Corrected model	198.137a	2	99.069	0.607	0.549
Intercept	17422.243	1	17422.243	106.744	0.000
Pretest	157.927	1	157.927	0.968	0.330
Groups	28.417	1	28.417	0.174	0.678

Error	9140.032	123	163.215
Total	331387.000	125	
Corrected Total	9338.169	124	

a. R Squared = 0.021 (Adjusted R Squared = - 0.014)

Table 4 shows ANOVA test for significant difference in the mean achievement score of male and female Students exposed to peer-assessment strategy. At $df = 1, 123$, $F = 0.174$, $p = 0.678$ ($p < 0.05$). This indicated that significant level is greater than Alpha level ($p < 0.05$). This suggested statistically no significant difference in the mean achievement score of male and female students exposed to peer-assessment strategy. Thus, the null hypothesis three is accepted hence, there is no significant difference in the mean achievement score of male and female students exposed to peer assessment strategy. It means that students' achievement in Biology is not affected by gender.

Discussion of Findings

Findings based on research question 1 shows pre-test and post-test achievement mean score of students in the experimental and control groups. The variation in the pretest and posttest mean achievement scores for experimental group is 32.42 and 10.54 for conventional group as mean achievement gains. This is an indication that students in the experimental group had a higher mean score of (73.88) after treatment using peer assessment than those in the control group. This finding negates the null hypothesis 1 earlier formulated by the researcher. Specifically, the result indicated the significant difference in the achievement means scores of students exposed to peer-assessment strategy and of those exposed to conventional method. This finding is in agreement with the findings of Mawak and Odulum (2023) which investigated the effects of peer assessment strategy on students' attitude and achievement in Mathematics in senior secondary schools and reported that peer assessment strategy had significant effect on the attitude and achievement of students in Mathematics, and a significant difference exists in the achievement mean scores of students exposed to peer assessment strategy and those not exposed to it. This showed that students introduced to peer assessment will not only excel in their academic achievements but also develop a positive interest towards that subject.

In addition, the findings are similar to that of Bokolo and Joe (2021) which investigated the effect of peer assessment in Oral English achievement of senior secondary school students and the moderating influence of learning style and reported that there is a significant difference in achievement of students in peer-assessment group. The implication of this is that peer-assessment is effective and efficient in ensuring the development of the desired knowledge, skill and capabilities required in students. Also, Udechukwu (2020) reported that both assessment techniques had a significant positive effect on students' performance. However, the result further showed that those in peer-assessment groups performed significantly better than those in the self-assessment group, even after controlling for the pretest.

This result however contradicts the findings of Alade and Olagunju (2015) which determined the effect of Peer- Assessment Strategy on secondary school (2) students' achievement in Economics subject and reported that there is no significant difference in the

mean achievement scores of students taught with Peer-Assessment Strategy ($t = 44.017$, $p = 0.00$) while there is no significant difference in the mean achievement scores of students taught without Peer-Assessment Strategy, ($t=1.135$, $p = 0.282$), all at 0.05 level of significance.

Findings based on research question 2 shows mean and standard deviations for difference in the mean achievement scores of male and female students exposed to peer-assessment strategy. This is an indication that the achievement of male students in Biology do not significantly differ from those of female students. This finding negates the null hypothesis 3 earlier formulated by the researcher. Specifically, the result indicated that there is no significant difference in the achievement means scores of male and female students exposed to peer-assessment strategy. This finding is in agreement with the findings of Moreso, Bashir (2022) who determined effect of peer assessment strategy on students' academic achievement in Mathematics in senior secondary schools and reported that there is no significant difference in the mean achievement scores of male and female students exposed to peer assessment strategy in Mathematics ($t=0.385$, $p=0.695$).

In addition, the findings are similar to that of Adediwura (2015) who revealed no gender difference in the implementation of peer assessment programs of both male and female students exposed to peer assessment strategy. The implication is that peer assessment had no gender bias in terms of improving students' academic achievement. This result however contradicts the findings of Okeke, Basil and Catherine (2023) which investigated the effect of self and peer assessment techniques on secondary school students' academic achievement and reported that both assessment techniques are effective but students assessed graph contents using peer assessment achieved higher than those assessed with self-assessment. It was also found that there is significant difference in the mean academic achievement scores of male and female students assessed in graph contents in Economics with self-assessment technique and those assessed with peer assessment technique. Also, Omaka and Osuafor (2020) reported that students exposed to peer assessment technique performed better than those exposed to teacher assessment technique and that male student had a greater mean score than their female counterpart when exposed to both assessment technique.

Conclusion

Based on the findings of this study, it was concluded that peer assessment strategy has been found to have a positive effect on students' achievement in this study. This study has shown that students who engage in peer assessment tend to achieve higher grades than those who do not.

Recommendations

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

1. Teachers should incorporate peer assessment strategy into their teaching and learning of Biology so as to improve students' achievement.
2. Schools should provide professional development opportunities for teachers to learn about peer assessment and how to effectively incorporate it into their teaching practices.
3. Teachers should provide clear guidelines and criteria for peer assessment to ensure its effectiveness and fairness.

4. Students should be given opportunities to reflect on their own work and the work of their peers during peer assessment to enhance their learning and self-awareness.

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