

**ID:2672 EFFECT OF PEER- ASSESSMENT STRATEGY ON SENIOR SECONDARY
SCHOOL STUDENTS' ACHIEVEMENT IN AGRICULTURAL SCIENCE IN IMO
STATE**

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Abstract

This study focused on the effect of Peer- Assessment Strategy on Senior Secondary School Students' Achievement in Agricultural Science using cooperative learning strategy in Imo State. Two research questions were raised and answered and two null hypotheses were formulated for the study. Quasi experimental, non-equivalent pretest-posttest control group design was adopted in this study. The population of the study comprised 3, 022 senior secondary class two (SSII) students from 18 public senior secondary schools in Okigwe education zone of Imo State. A sample of 96 Agricultural Science students got by purposive sampling technique from two selected secondary schools. It comprised of 26 male and 23 female assigned to experimental group and 25 male and 22 female assigned to control group. Two intact classes were used for the study. The instrument for data collection was Agricultural Science Achievement Test (ASAT). The instrument was subjected to face and content validation by three research experts had reliability index of 0.78 obtained using Kuder-Richardson K-R20. The data collected were analysed using the mean and standard deviation and Analysis of Covariance. Findings revealed that Agricultural Science students taught with cooperative learning strategy and exposed with Peer-Assessment Strategy achieved better than students taught with cooperative learning strategy and exposed with traditional method of assessment. That there was a significant difference in the mean achievement of students taught Agricultural Science using cooperative learning strategy with peer assessment strategy and students' taught Agricultural Science using cooperative learning strategy with traditional method of assessment, that there is no significant difference between male and female students taught Agricultural Science using cooperative learning strategy with peer assessment strategy. Based on the findings, it was recommended among others, that Agricultural Science teachers should be encouraged to adopt Peer-Assessment as Strategy in their teaching assessment to improve students' academic achievement in Agricultural Science.

Keywords: Peer-Assessment Strategy, Agricultural Science and Gender.

Introduction

Agriculture is the production of food, feed, fibre and other goods by the systematic growing and harvesting of plants and animals. Agriculture is seen as the entire range of technologies associated with the production of useful products from plants and animals, including soil cultivation, crop and livestock management and the activities of processing and marketing, (Iwena, 2012). It is a channel through which man obtains both fleshy and vegetable foods, fibre for cloth and even wood and plant coverings for shelter. Agriculture is the most essential activity for human survival; because it feeds, produces basic commodities for the society and provides gainful employment for the majority of people (Iwena, 2012). Augustine (2013) described Agriculture as the profession of majority of humans. Hence, it is not out of place to say that Agriculture is the basic foundation upon which all other spheres of human development stands.

Agricultural sector has been regarded as the mainstay of the Nigerian economy since 1970's, with high potential for foreign exchange earnings. This sector is very important in the third world countries, especially Nigeria. This is because it provides food supply, employment and export earnings for the economy. According to Oyejide (2008), Agriculture is the sector accounting for the dominant share of gross domestic product (GDP), employment, export earnings and food supply, carries a great deal of the economic burden and contains much of the potential of many economies. Ndupuechi (2009) stated that Agricultural sector is the largest sector in the Nigerian economy with its dominant share of the GDP, employment of more than 70% of the active labour force and the generation of about 88% of non-oil foreign exchange earnings. Its share of the GDP increased from an annual average of 38% during 1992 to 1996 to 40% during 1977-2001 compared to crude oil; and GDP declined from an annual average of 13% in 1992-1996 to 12% during 1997-2001 (Oyejide, 2008). Agricultural sector is believed to be critical for both overall economic growth and the reduction of poverty in any society. In the face of all these basic importance of Agriculture, teaching of Agricultural Science at primary, secondary and tertiary schools level should be given adequate priority. The extent to which the teaching of Agricultural Science fulfills its intended purposes, functions and goals matter so much in teaching and learning Agricultural Science since this is a measure of teaching effectiveness. Scholars have agreed on the facts that the teaching of Agricultural Science at senior secondary school level faces problems which have been causing poor performance of students in the subject. Smmitter (2008) warns that Agricultural Science as a subject is dying gradually in schools as a result of the reduction in the number of students being trained to become Agricultural Science teachers.

Although Smmitter (2008) identified some reasons which are that: Agricultural Science is a difficult subject which requires a strong grasp of Mathematics and Biology and this limits the number of those who are able to be admitted to the subject area; Agricultural Science is not part of the compulsory subjects indicated in the National Policy on Education (FRN, 2013). Therefore, some schools have squeezed out the subject; the methods of teaching used by Agricultural Science teachers make the subject complicated for the students to understand. Ndupuechi (2009) stated that the teaching of Agricultural Science at the senior secondary school level presents problems that are common to the other areas of human endeavour like business and commerce.

In addition the teacher of Agricultural Science encounters some problems which seem to be peculiar to the subject. He also stated further that understanding Agricultural Science seems particularly difficult as much of the subject matter appears familiar to the students in a superficial manner because it deals with abstraction; the subject does not lend itself to concrete illustrations and models as in Chemistry, Physics and Engineering. Beside this, the subject does not always seem logical to the students. Augustine (2013) reported that for

students to be able to comprehend and use basic Agricultural Science concepts, there is the need for widespread improvement in the teaching and assessment methods as these would yield enormous benefits to individual and the nation. Danmole and Lameed (2014) noted that teachers need to employ different learning methods and assessment strategies to ensure students' understanding of scientific concepts. A shift is therefore advocated by researchers to methods that will enable the learner construct his/her own understanding. Such methods have their roots in constructivism. This trend is learner centered and among these strategies is the cooperative learning strategy.

Cooperative learning is described as the instructional practice of placing students into small groups and having them work together toward a common goal. Each group member learns new materials and helps other group members learn important information. Cooperative learning strategy consists of social interactions among students based on equal partnership in the learning experience, as opposed to fixed teacher-learner roles (Olorukooba, 2012). Lessons are designed around tasks, problems and projects, which students work through in small mixed ability groups. Proponents of cooperative learning claim that the active exchange of ideas within small groups not only increases interest among the participants, but promotes critical thinking.

There is persuasive evidence that cooperative teams achieve higher levels of thoughts and retain information longer than the students who work quietly as individuals. The shared learning gives students an opportunity to engage in discussions, take responsibility for their own learning, and thus become critical thinkers (Amosun, 2012). Chang and Mao (2018) in his study found that cooperative learning strategies improved the students' performance. These earlier researches showed that the use of cooperative learning strategy was more effective in the learning of biology concepts yet there is still evidence of poor performance in the subjects by the Secondary school biology students as shown above. None of the earlier studies on the use of cooperative learning strategy included the use of peer assessment strategy.

Assessment is the systematic collection, review and use of information about educational programme, undertaking for the purpose of improving students learning and development. Onuka and Oludipe (2006) viewed assessment as an effective tool of promoting students' achievement. Also, Onjewu (2006) defined assessment to include all the processes and products which described the nature and extent of learning, its degree of correspondence with the aims and objectives of teaching its relationship with the environment which are designed to facilitate schooling and learning.

Assessment therefore is viewed to be an effective tool of promoting students achievement. The role of assessment in teaching and learning process cannot be over emphasized. Assessment when effectively carried out gives a comprehensive feedback on how well students understand the information and also helps the teachers to improve the design of the instruction. Anikwese (2005) observed that assessment takes place after learning but however the peer assessment has come up after one lesson before the commencement of another class.

Assessment is central to the overall quality of teaching and learning, since a well defined assessment sets clear expectations, establishes a reasonable workload on teachers, provides students the opportunity to self monitor their work because learners have delight in making decision unlike the teacher's made test and the standardized test which provide little information about students learning. Augustine (2013) observed that the field of Agricultural Science has placed too little value on the importance of teaching methods and assessments in

recent decades. He agreed that the best method is only that which helps the particular students to achieve more. The teacher must therefore continue to search for the method which best serves his students' interest. In order to enhance better learning and understanding of the basic concept of Agricultural Science by the students, appropriate teaching and assessment strategies which must be student-centred need to be employed. One of the methods being suggested in this study is the Peer- Assessment Strategy.

In peer- assessment, learners are given the opportunity and also take delight in making decision and valid judgment about their own performance. Peer assessment is an important element of designing learning environments in order for them to become more participatory among students, which can achieve concepts such as learning between peers, collaborative learning, and problem-solving based learning (Kollar & Fisher, 2010; Tan & Keat, 2005). Peer-Assessment Strategy is the process whereby students grade assignments or tests, of their mates or peers based on a teacher's benchmarks. Race (2001) 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 (2003) found in his study that Peer-Assessment and Peer-learning were effective and efficient in ensuring the development of the desired knowledge, skill and capabilities that faculty required. Orsmond (2005) who defined Peer-Assessment as the assessment of student's work by other students stated that engaging students in Peer-Assessment can help them in learning to evaluate their own learning and in interpreting assessment criteria. Further benefits might also include; increasing feedback to students; reducing marking loads for staff; giving students a sense of ownership of assessment process; encourage critical analysis of students' work, so students see beyond a mark/grade. He finally concluded that the disadvantages are encountered when students lack the ability to evaluate each other, do not take the assessment seriously, or fear discrimination.

Peer assessment in the education field has been achieved at an increasing rate in recent decades, using it as an assessment tool (Gielen & De Wever, 2015). It represents a system for learning built on the basis of that learning directed around the learner with the other in depending on effective learning, which focuses on the full integration of the student in the process of collaborative learning with peers under the supervision of the teacher (Thomas, Martin & Pleasants, 2011). Peer assessment is used to enhance learning as an effective way to increase motivation for students by engaging them in the evaluation process which has received attention in recent years from a number of international universities (Rimer, 2007), and to encourage peers to help each other to master the topic of learning.

Peer assessment also aims to describe the assessment processes that foster future learning and mitigate difficulties that are expected to occur. Saddler and Good (2006) reported that the teachers' grading can be more accurate as a result of Peer-Assessment Strategy. If the teachers look at how students' grade themselves, it helps them to have more information on the contents of the subject which would improve their performance in other tests on the subject. Andrade (2007) stated that although under Peer- Assessment Strategy- students may give better grade than when assessed by teachers, since the teacher wants to reduce grading time at the cost of losing accuracy, the method improved the achievement of performance of the students and their deep understanding of the contents of the subject concerned.

The growing need for food security and self employment has made it imperative that increased attention be given to the study of Agricultural Science at all levels of education especially in secondary schools. Despite the importance of Agriculture to human and national

development, students performance in the 2017 Senior Secondary School Certificate Examination was very poor as total number of 1425 candidates representing 11.28% obtained credits in Agricultural Science (NECO Chief Examiner, 2017). While there can be several factors contributing to the failure, use and non-use of peer assessment might have a potential effects on achievement scores. Mavida (2016) revealed that the utilization of peer assessment make students participate effectively in the learning process, hence ending with quality education that enable them to compete favourably in the society in relation to technological changes. Rasul (2011) reported that peer assessment play important role in teaching and learning process.

Moreover, as knowledge explorers, Agricultural Science teacher must as a matter of necessity abreast knowledge of current trends in research network and innovations, in the world of education as with regards to teaching and learning with assessment. This knowledge can only be enhanced through adequate utilization of peer assessment that will lead to quality assessment during lessons. There is a general concern by stakeholders in education about the poor performance of secondary school students in all subjects including Agricultural Science. The major cause may be as a result of poor teaching methods and assessment strategies used by teachers which do not enable the students to understand the content of the subject better and also make the subject more difficult to comprehend. Research evidence also attests to the facts that there is differential performance of male and female students in the sciences (Mitchell & Hoff, 2006). The number seems to favour boys more than girls (Mitchell & Hoff, 2006). Females have low enrolment rate in the sciences like Physics, Chemistry and Agricultural Science. Instead, they perform better in reading and writing skills (Penner, 2007). Based on the foregoing, the problem of this study was to investigate the effect of Peer-Assessment Strategy on Senior Secondary School Students' Achievement in Agricultural Science in Imo State.

Research Questions

The following research questions guided the study:

1. What is the effect of peer assessment strategy and conventional teaching method on achievement mean score of students in Agricultural Science?
2. What are the effects of gender on the mean achievement score of Agricultural Science students when exposed using peer assessment strategy?

Hypotheses

1. There is no significant gender difference in the achievement scores of students when exposed to Peer-Assessment Strategy.
2. There is no significant difference between the mean achievement scores of two groups of Agricultural Science students exposed using peer assessment strategy and conventional method.

Method

Quasi experimental, non-equivalent pretest-posttest control group design was adopted in this study. Nworgu (2015) stated that quasi-experimental design is a design in which intact or pre-existing groups are used where random assignment of subjects to experimental and control groups is not possible. The population of the study comprised 3, 022 Senior Secondary class two (SSII) students from 18 public senior secondary schools in Okigwe educational zone of

Imo State. A sample of 96 Agricultural Science students got by purposive sampling technique from two selected secondary schools. It comprised of 26 male and 23 female assigned to experimental group and 25 male and 22 female assigned to control group. Two intact classes were used for the study. This number was representative as well as make for effective management of subjects during the experimental treatment. Two intact classes were used for the study. Purposive sampling technique was used in the selection of two secondary schools for the study.

The instrument used for the study was the fifty (50) items Agricultural Science Achievement Test (ASAT). The items were adapted from West African Senior School Certificate Examination (WASSCE) past question papers. Each item has 4-optioned numbered A to D. The test was based on the topic (Agricultural Ecology) in SSII Agricultural Science scheme of work used for the study. The instrument was subjected to face and content validation by three research experts from the department of Science Education, Measurement and Evaluation Unit. They made corrections, changes, modifications, contributions and suggestions regarding the items in the Achievement Test. Lesson plans in line with the research purposes, questions and hypotheses were developed for validation of ASAT. Their modifications and corrections were duly effected in the final draft of the instruments. Also, a Table of specification was developed by the researcher to ensure the content validity of the ASAT.

ASAT was administered to 30 Agricultural Science students from a different school that was not from the sample schools. Kuder – Richardson Reliability Estimate (K-R20) was adopted to determine the reliability of ASAT and the reliability index of 0.78 was obtained.

The experimental group was taught with cooperative learning strategy and exposed to training on Peer-Assessment Strategy for three weeks while the control group was taught using cooperative learning strategy with traditional method of assessment.

The researchers administered the prepared (50) items Agricultural Science Achievement items to both experimental and control group first as pre-test. The researchers marked the scripts for both groups. After, the researchers exposed the experimental group to how to mark each others' scripts, that is, the points to look out for and marks to be awarded for the points identified as indicated in the marking guide. After this they give a total score, the training covered a period of 3 weeks. After three weeks the same Agricultural Science Achievement Test was re-administered to both the experimental and the control groups. The researchers marked the scripts for the control while the experimental group members were made to exchange their scripts and mark for each other using the marking guide prepared for the test. The researcher latter checked the scripts of the training group members to confirm the scores awarded by the peers. The results of participants in the pre-test and post-test Agricultural Science Achievement Test were collated for analysis to be able to see the effect of Peer-Assessment Strategy on the academic achievement of both groups in the subject. The statistical tools used were the mean, standard deviation and Analysis of Covariance (ANCOVA). The study hypotheses were tested at 0.05 level of significance.

Results

Research Question One

What are the mean differences of students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group) and students' taught

Agricultural Science using cooperative learning strategy with traditional method of assessment (control group)?

Table 1 Mean Difference of Students Agricultural Science exposed with Peer Assessment Strategy and Traditional Method of Assessment.

Groups	N	Pre-test		Post-test		Mean Difference
		Mean	SD	Mean	SD	
Control	47	41.28	10.13	53.38	11.91	12.10
Experimental	49	41.74	10.47	71.26	13.69	29.52
Mean difference		0.46		17.88		

Result in Table 1 indicated that the pre-test mean achievement score for control group and experimental group were 41.28 and 41.74 with standard deviation of 10.13 and 10.47 respectively and mean difference of 0.46 at pre-test. This indicated that both Experimental and control groups were relatively at the same achievement before treatment. However, the post-test achievement mean scores for Experimental and control groups were 71.26 and 53.38 respectively with standard deviation of 13.69 and 11.91 respectively with mean difference of 17.88. The higher mean effect achievement score of experimental group of (29.52) over control group of (12.10) indicated that cooperative learning strategy with peer assessment strategy has relative effect on students' achievement in Agricultural Science.

Research Question 2

What are the mean differences of male and female students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group)?

Table 2 Mean Differences of Male and Female Students Taught Agricultural Science Using Cooperative Learning Strategy with Peer Assessment Strategy

Gender	N	Pretest		Post-test		Mean effect
		MEAN	SD	MEAN	SD	
MALE STUDENTS	26	45.14	10.92	69.95	13.52	24.81
FEMALE STUDENTS	23	46.28	11.53	72.06	13.95	25.78
Mean difference		-1.14		2.11		

Result in Table 2 indicated that the pre-test mean scores for male and female students were 45.14 and 46.28 with standard deviation of 10.92 and 11.53 respectively and mean difference of -1.14 at pre-test. This indicated that both male and female students were

relatively at the same level before treatment. However, the post-test male and female achievement mean score for experimental group were 69.95 and 72.06 respectively with standard deviation of 13.52 and 13.95 with mean difference of 2.11. Equally, the mean effect of 25.78 female against the mean effect of 24.81 male indicated the treatment have slightly effect on the female students.

Hypothesis one

There is no significant difference in the mean achievement of students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group) and students' taught Agricultural Science using cooperative learning strategy with traditional method of assessment (control group).

Table 3: Analysis of Covariance (ANCOVA) for the Achievement Mean Score of Agricultural Science Students Exposed using Peer Assessment Strategy and Traditional Method

Source of variation	Sum of Squares	Df	Mean Square	F	p-value.	Decision
Corrected Model	10959.803 ^a	2	5479.902	43.979	.000	
Intercept	9519.316	1	9519.316	76.398	.000	
PRETEST	2967.443	1	2967.443	23.815	.000	S
GROUP	9984.920	1	9984.920	80.135	.000	
Error	11587.957	93	124.602			
Total	410926.000	96				
Corrected Total	4101.911	95				

a. R Squared = .786 (Adjusted R Squared = .616), S = Significant

Result of data analysis in Table 3 shows that the probability value associated with the calculated value of F (80.14) for the mean achievement scores of two groups of Agricultural Science students exposed peer assessment strategy and conventional method is 0.000. Since this value (0.000) is less than the 0.05 alpha when tested at 0.05 level of significance, the null hypothesis is rejected. Hence, there was a significant difference in the mean achievement of students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group) and students' taught Agricultural Science using cooperative learning strategy with traditional method of assessment (control group). This result indicates that peer assessment strategy is superior to traditional method in enhancing students' achievement in Agricultural Science when taught using cooperative learning strategy.

Hypothesis 2:

There is no significant difference between male and female students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group).

Table 4: Analysis of Covariance (ANCOVA) for Male and Female Students Taught Agricultural Science Using Cooperative Learning Strategy with Peer Assessment Strategy

Source of variation	Sum of Squares	Df	Mean Square	F	P-value	Decision
Corrected Model	900.048 ^a	2	450.024	6.317	.049	
Intercept	671.064	1	671.064	9.420	.033	
Pretest	592.023	1	592.023	8.311	.045	
Gender	126.655	1	126.655	1.778	.542	NS
Error	3276.887	46	71.237			
Total	5566.677	49				
Corrected Total	5176.375	48				

. R Squared = .313 (Adjusted R Squared = .196) NS = Not Significant

The analysis in Table 4 revealed the F calculated value of (1.778) and P-value .542. Since this p-value is greater than the 0.05 alpha when tested at 0.05 level of significance, the null hypothesis which states that there is no significant difference between male and female students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group) is thereby upheld. It implies that there is no significant difference between male and female students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group).

Discussion

The result of the study showed that there is a strong difference in the mean achievement scores of Agricultural Science students taught with cooperative learning strategy and exposed with Peer-Assessment Strategy, that cooperative learning strategy with peer assessment strategy has relative effect on students' achievement in Agricultural Science. The corresponding hypothesis affirmed that there was a significant difference in the mean achievement of students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group) and students' taught Agricultural Science using cooperative learning strategy with traditional method of assessment (control group). This result indicates that peer assessment strategy is superior to traditional method in enhancing students' achievement in Agricultural Science when taught using cooperative learning strategy. This supported previous findings by Race (2001) who listed among the advantages of Peer- Assessment Strategy that it encourages deep learning by students, which leads to improvement in students' performance than the other regular assessment practices. Also Juwah (2003) agreed and stated that the evidence from his study showed Peer-Assessment practice is an effective and efficient assessment strategy that leads to high academic achievement of students. Sadler & Good (2006) stated that Peer-Assessment Strategy apart from enabling students to grade their peers based on teachers' benchmarks; the practice apart saving the teachers time, also improves students understanding of the course

materials. In addition, it improved their meta cognitive skills and their academic performance in the subject.

The result of the study further revealed that both male and female students taught using cooperative learning strategy and exposed with peer assessment strategy were relatively at the same level of before and after the treatment. The corresponding hypothesis affirmed that there is no significant difference between male and female students taught Agricultural Science using cooperative learning strategy with peer assessment strategy (experimental group). The finding is similar to the view of Augustine (2013) who recommended that appropriate methods need to be used in teaching the contents of Agricultural science in secondary schools and that other proper assessment strategies should be used to measure the level of male and female students' understanding in the subject other than the present conventional methods being used. Also Tahir (2012) recommended appropriate new methods of teaching and assessment if improvement in students' performance in all subject is expected. The finding agreed with that of Dayioglu (2004), who agreed that gender difference is not a significant issue of academic performance among male and female students. He concluded that the female students usually compete with their male counterparts and even excel in their studies. Farooq, Chaudhry, Shafiq and Berhanu (2011), when comparing single sex and coeducational outcome, they concluded that, the result of both are equal, which means that, there is no significant gender difference in the academic achievement of students when exposed to better methods of teaching and assessment which can enable them understand the contents of the subject better.

Conclusion

Based on the findings of this study, it could be concluded that when Peer-Assessment Strategy is properly used by teachers with cooperative learning strategy, the academic performance of the students will not only improve but it can also enable the students to better understand the contents of the subject. Proper understanding of the contents of the subject will enable the students not only to perform better in the teacher-made tests but also perform excellently in external examinations which are made-up of standardized test items. Also, this research has confirmed that all the other regular methods of teaching and assessments given to the control group did not improve their academic achievement significantly in this research.

Recommendations

In the light of findings from this study, the following recommendations are being made:

1. Peer-Assessment Strategy should be used by teachers with cooperative learning strategy in the teaching and assessment of students in Agricultural Science.
2. All stakeholders in the Education sector need to enforce the encouragement of teachers to have additional/ higher qualifications in Education, so that they will be exposed to different methods of teaching and assessment which always help to improve the academic performance of the students.
3. The parents and students should be made aware of the fact that there is no gender influence on students' academic performance; when they have been introduced to effective methods of teaching and an assessment, that will make them understand the contents of the subjects taught, they will excel in their academic achievements.

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