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Comparative Study on Peer Assessment and Teacher Assessment Strategies for Students'achievement in Basic Science, Jalingo Education Zone Taraba State, Nigeria

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Abstract
The study investigated comparative study on peer assessment and teacher assessment strategies for Basic Science Students' academic achievement in Jalingo Education Zone, Taraba State, Nigeria. The main purpose of the study is to determine the effect of peer assessment and teacher assessment strategies on Basic Science students' achievement of Jalingo Education Zone, Taraba State. Accordingly, 2 specific objectives, 2 research questions were raised and 2 null hypotheses were formulated to test the generalization of findings. The research design adopted for the study was quasi experimental design. The population of the study was 10, 253 Upper Basic II students in Jalingo Education Zone consisting of 6,100 males and 4,153 females. Purposive and multistage sampling techniques were used to select samples for the study.
Accordingly, two Government owned Secondary Schools were selected. Two intact classes from the two (2) Government owned secondary schools were randomly selected and assigned to experimental group (exposed to peer Assessment Strategy n=30) and control group (exposed to teacher assessment strategy, n=35). A well validated 20 item Basic Science achievement test (BSAT) was developed as instrument for data collection on achievement.The reliability of (BSAT) instrument was determined with Kuder-Richardson formula 21 ($k=^{R}21$) and the reliability obtained was 0.77 indicating a strong relationship the inter-item consistency. Thus, the BSAT instrument was adopted as very reliable for the study. Pre-test and post-test on students academic achievement in Basic Science for both experimental and control groups were analysed using mean(x), and standard deviation(SD). It was observed that post-test mean score of experimental group (peer assessment, x=30.91) exceeds the post-test mean score of control group (teacher assessment, x = 24.11). It was also observed that academic achievement of students assessed using peer assessment and teacher assessment differed by gender with post-test mean academic achievement score of male and female exposed to peer assessment (males x=35.98; females x=30.16) exceeds the post-test mean academic achievement score of males and females exposed to teacher assessment, (males, x=25.06, females, x= 22.58).Analysis of covariance (ANCOVA) was used to test the null hypotheses at 0.05 alpha level of significance. It was found that peer assessment has significance effect on students' academic achievement in Basic Science more than those of them exposed to teacher assessment. The null hypothesis I was therefore rejected. (ANCOVA test is F=28. 131, P< 0.05). Similarly, the finding of the hypothesis II revealed a significant difference in the academic achievement of males and females exposed to peer assessment. The null hypothesis II, was rejected. (ANCOVA test is F=41.011, P< 0.05).Based on the findings of the study, it was recommended that there should be a clarion call for teachers to adopt the peer assessment strategy alongside teacher assessment strategy in the assessment of students' academic achievement in Basic Science.

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I. Introduction

Assessment is a key component of learning because it helps students learn. (Spanella & Pisano, 2011)opined that when students are able to see how they are doing in a class, they are able to determine whether or not they understand learning material. Assessment can also help to motivate students. Spanella and Pisano had earlier reported that if students know they are doing poorly, they may begin to work harder. Just as assessment helps students, assessment helps teachers. Frequent assessment allows teachers to see if their

teaching has been effective or not. Similarly,assessment allows teachers to ensure thatstudents learn what they need to in order to meet the subject's learning objectives. Effective assessment tests students and teachers, as well as the lesson itself. At its simplest, assessment is important because it is a system of quality control that continually checks to make sure that teachermethods and students learning methods are successful. (Watsica, 2011)reported that through assessments, teachers can recognize special intellectual gifts in their students. When this happens, a teacher can challenge a student in different ways. The ability of the learner to accept the teachers' challenge courageously could be the way out in the quest for effective scientific and technological development which the country is in dire need.

The application of assessment test in Science and technology are veritable teaching techniques for scientific and technological advancement of any nation. This fact is enshrined in the National Policy on Education of the Federal Republic of Nigeria (FRN), 2014) which states that science and technology education should among other tools equip students to live effectively in the 21st century. To achieve this goal, teaching and learning are viable instruments for inculcating necessary scientific knowledge, skill, and competencies. In order to inculcate the necessary scientific knowledge, skill competencies and attitudes in various developmental strategies such as world declaration education for all are put in place in Nigeria educational system, other strategies like NEEDs (National Economic Empowerment Strategies) and SDGs (Sustainable Development Empowerment Goals) were put in place in order to meet these goals. Federal Ministry of Education overhauled the existing integrated science curriculum in terms of contents and nomenclature in order to cater for the scientific needs of the nation as it aspires to be among the first 20 top economically stable countries in the globe by 2020 (FRN, 2012).

The upgrading of Integrated Science to Basic Science has made the subject to become one of the best approach to meet some of the industrial and scientific challenges facing Nigeria. Despite the importance of Basic Science in the country's quest for scientific and technological advancement, there has been seemingly ineffective assessment strategies of the subject as reportedby some scholars such as Bukunola and Idowu (2012), Osokoya (2013), Alabi (2015) and Samuel (2017). According to these scholars, the poor assessment strategies employed in the assessment of students' achievement in Basic Science contributed to student under achievement. This findings could also be one of the reasons behind students' low achievement in Science since Basic Science is the foundation of Science Education in Nigeria.

Assessment is an inevitable teaching strategy in educational system. This is because, assessment may influence effective learning. Validation of teacher made test items makes assessment result more reliable. Reliable assessment findings on learner's abilities provide authentic feedback forrevision to improve learning. Furthermore, assessment result provides meaningful engagement activities for students in the learning process.In this way, assessment could affect motivation. Assessment could also enhance delivering of instructions by helping the teacher to recognize student's weaknesses and strength. To achieve this objective, the activity and the process of assessment should be made valid, fair, ethical, feasible and efficient tools for learning using multiple measures (Mousari, 2012). The multiple measures could be the different types of assessment which include self- assessment, peer assessment, teacher assessment among others.

The present research investigated the effects of two types of assessment, namely, peer and teacher assessment on student's achievement in basic science in Taraba State. Indeed, peer assessment is a shift of paradigm from the traditional psychometric (teacher-centered) testing to alternative Educational metric (students-centered) assessment (Friday, 2016; Mcnamora, 2012, Broom & Hudson, 2010). The implementation of student-directed assessment arises out of a faith in student autonomy as an educational goal (Boud, 2013). Powell (2014, p.209), summarizing the value of these strategies claim that: The promotion of independent learning is central to the whole enterprise of education because the intellectual power which it seeks to foster cannot be exercised except in an independent mode. Critical thinking, judgment, creativeness, initiative, interpretative skills, hypothesis formulation and problem-solving capacities can only be made manifest by someone who is operating independent. Research studies involving peer and teacher assessment have indicated that in order to achieved these tasks, there is need for effectively training of an individual (Adams & King, 2015; Freeman, 2015). These scholars findings confirmed the report of Birdsong and Sharpin, (2016) who reported that peer and teacher assessing can work towards developing students higher order reasoning and higher level cognitive thinking skills, helping nurture students-centered learning among basic science education students).

From another point of view, Hussain (2019) revealed that teachers' teaching experiences and assessment practices interacted significantly with students' characteristics in influencing students' achievement goals. Stowers (2011) was of the opinion that teacher assessments were very important (sometimes more important than student assessments). Stowers had submitted that when grading a test (formal assessment) or having a discussion (informal assessment), student responses could be used to insure that they are absorbing the material the teacher needs them to. For example, if all of the students miss the same question in a test, something is wrong with the question--or I the teacher did not go over the test material well enough to provide mastery. In those instances, the teacher I throw out the question, reteach, and re-assess.Applying student-

directed assessment for improving students course achievement may signify that peer assessment is particularly good for low-stakes assessment: low-stake's assessment would include formative assessment, where the students' performance in the assessment task in question task is not considered in the calculation of their overall mark for the subject.

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 (Kallar&Fischer 2010). Peer assessment is aimed at transforming studentsfrom beingmere receivers of knowledge from teachers to memorized and recall on test to learners that participate actively in the learning and evaluation process, interaction, search and explore and relationships between objects in order to generate new knowledge characterized by critical thinking and creativity. Peer assessment helps to ensure a quality education for all learners (Roger &Threat, 2017). This implies that both male and female learners could attain quality education through peer assessment which is likely to check the issue of gender gap in science education.

One of the problems that attracts public concern in Nigeria today is gender gap in academic achievement of students. Observable disparity has been blamed on a number of factors, including social, economic, and cultural stereotyping. Gender is the range of physical, biological, mental and behavioral characteristics pertaining to and differentiating between the feminine and masculine (female and male) population (Adigun, Onihunwa, Irunokhai, Sada, &Adesina, 2015). The gender gap in basic science students' achievement in some concepts as observed by Danjuma (2015) was not a significant factor. However some educators in the likes of Busola (2011) reported that a significant difference exist the achievements of male and female student. It is as a result of some of these disparities that the researchers carried out this investigation to find out the effect of peer assessment on basic education students' achievement in Basic Science using Gender as a moderating variable.

Purpose of the Study

The main purpose of this study is to investigate the effect of Peer Assessment and the teacher made assessment strategieson Basic Science Students' Achievement in Jalingo Education Zone Taraba State, Nigeria. Specifically the study would seek to determine:

(i) The relative difference in the mean achievement scores of students assessed using peer assessment and those assessed using teacher assessment in Basic Science.

(ii) The influence of gender on the mean achievement scores of students assessed using peer assessment and those assessed using teacher assessment in Basic Science.

Research Questions

The following research questions were formulated to guide the study.

(i) What is the difference in the mean achievement scores of students assessed using peer assessment and those assessed using teacher assessment in Basic Science?

(ii) What is the influence of gender on the mean achievement scores of students assessed using peer assessment and those assessed using teacher assessment in Basic Science?

Statement of Hypotheses

The following null hypotheses were tested to guide in generalization of findings. All the null hypotheses were tested at 0.05 alpha level of significance

HO_1: There is no significant difference in the mean achievement scores of students assessed using peer assessment and those assessed using teacher assessment in Basic Science

HO_2: Gender does not have significant influence on the mean achievement scores of students assessed using peer assessment and those assessed using teacher assessment in Basic Science

II. Research Methodology

Quasi experimental research design was employed for the study. The population of the study was made up of Upper Basic II students in JalingoEducational Zone with a total of 10,253 students, 6,100 males and 4, 153 females. TheJalingo Education zone is made up of three (3) local government areas, namely; Ardo-Kola, Lau and Jalingo. Multi stage and purposive sampling were used to selectsample for the study. Using purposive sampling, Jalingo Local Government Area was selected for the study after which two (2)Government owned Schools were selected. The schools were purposively sampled based on equivalence in students and manpower. Two (2) intact classes from the two (2) schools earmarked for the study were randomly assigned experimental group (exposed to Peer Assessment (n = 30)), and control group (exposed to Teacher Assessment (n = 35)).

Basic Science Achievement Test (BSAT) made up of two sections (A and B) developed by the researchers was used as instrument for data collection. Section A sought information on bio-data of students in respect to gender and school while section B sought information on student's achievement in Basic Science. 20-

items were developed by the researcher covering items on such topics as work, energy, power and simple machines. The choice of concepts was based on the fact that teachers find it difficult to teach those concepts effectively. The instrument of the study was validated by two(2) experts in Science Education from Taraba State University, Jalingo. The reliability of BSAT was determined using Kuder- Richardson formula 21 (K-R21) and the reliability coefficient was found to be 0.77 implying that the instrument was reliable for the study.

Basic science teachers in the area of study were trained in the skills of using Peer assessment strategy as well as the skill of administering BSAT to the subjects of the study for 1 week. The research assistants administered the pretest under the supervision of the researcher to the subjects of the study after which the responses of the subjects of the study were recorded. This was followed by application of the treatment which lasted for 4 weeks. After the treatment exercise, a posttest was administered to the subjects of the study after which their responses were recorded.

Data obtained from the pretest and posttest on students' achievement in Basic Science were analysed using mean and standard deviation to answer the research questions and analysis of (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The analysis of covariance was used to control initial group difference.

III. Result

Research question 1

What is the difference in the mean achievement scores of students assessed using peer assessment and those assessed using teacher assessment in Basic Science?

The data used to answer this research question is presented in Table 1

Table 1

Mean and standard deviation of Basic Science student's achievement exposed to peer assessment and teacher assessment.

Group	Type of Test	N	Mean	Sd	Mean Gain
Peer assessment	pre-test	30	13.08	3.09	17.38
	Post-test	30	30.91	2.72	
Teacher assessment	pre-test	35	20.09	3.81	14.02
	Post-test	35	24.11	2.08	

Table 1 shows that mean gain of the achievement scores of Basic Science students exposed to peer assessment (x=30.91) is higher than those exposed to teacher's assessment.(x-24.11)

Research question 2

What is the influence of gender on the mean achievement scores of students assessed using peer assessment and those assessed using teacher assessment in Basic Science?

The data used to answer this research question is presented in table 2.

Table 2

Mean and standard deviation of Basic Science student's achievement exposed to peer assessment and teacher assessment.

		MALE			FEMALE		
GROUP	TYPE OF TEST	X	SD	N	X	SD	N
Peer assessment	Pre-test	13.71	2.52	18	11.99	2.67	12
	Post-test	35.98	8.08	18	30.16	2.89	12
Teacher assessment	pre-test	11.56	2.05	22	10.09	2.17	13
	Post-test	25.06	2.47	22	22.58	2.41	13

Table 2 shows that post-test mean achievement scores of male in Basic Science exposed to peer assessment and teacher's assessment(x =35.98, x = 25.06), are higher than their female counterparts. (x 30.16, x = 22.58).This implies that male students achieved higher than their female counterparts when exposed to peer and teacher's assessment.

$H0_1$

There is no significant difference in the achievement of student assessed using peer assessment in Basic Science.

Table 3

Result of analysis of covariance of Basic Science student's achievement exposed to peer assessment

Source of variation	Sum of squre	df	Mean squre	f	Sig
Corrected mode	5813.009	2	1030.010	41.109	.000
Intercept	9560.031	1	9560.31	123.132	.000

Pre-test	2207.102	1	2207.102	55.173	.000
Group	724.321	1	724.321	28.131	.000
Error	2061.021		60		
Total	20365.484		65		

Table 3 shows that the ANCOVA test is F=28.131 p<0.05. This implies that there is a significance difference in the achievement of basic science students exposed to peer assessment. Therefore, the null hypothesis was rejected.

$H0_2$

There is no significance difference in the achievement of male and female students when exposed to peer assessment.

Table 4

Result of analysis of covariance of female and female Basic Science student's achievement exposed to peer assessment

SOURCE OF VARIANCE	SUM OF SQUARE	DF	MEAN SQUARE	F	SIG
Corrected model	3589.121	2	1710.210	50.009	.000
Intercept	5310.090	1	5310.090	97.109	.000
Test	3201.002	1	3201.002	69.083	.000
Group gender	697.341	1	697.341	41.011	.000
Error	241.001	60			
Total	20365.484	65			

Table 4 shows that the ANCOVA test is F=41.011, P<0.05. This implies that there is a significant difference in the achievement of male and female basic science students exposed to peer assessment. Therefore, the null hypothesis was rejected.

IV. Discussion

This study revealed that peer assessment has a significant effect on students' academic achievement in Basic Science more than Teacher assessment. This finding concurred with Whiteman (2012) and Annis (2013) who reported that peer assessment had an effect on students' academic achievement. However, Birdsong and Sharpin, (2016) were of the opinion that peer and teacher assessment can work towards developing students higher order reasoning thereby helping to nurture student-centered learning among Basic Science Education students. This implies that peer assessment is an important strategy for assessing students' academic achievement. The findings of the study is contrary to the findings of Stowers (2011) who was of the opinion that teacher assessments are very important (sometimes more important than student assessments). Recently, Hussain (2019) also revealed that teachers' assessment practices interacted significantly with students' characteristics in influencing students' achievement goals.

Similarly, the findings of the second hypothesis revealed a significant difference in the achievement of male and females in Basic Science students exposed to peer assessment. The contribution of this study to the existing body of knowledge is consistentwiththe work of Adesoji and Ibraheem (2009) who found that the difference in the achievements of male and female student was significant. However, this result was not in line with the report of Roger and Threat (2017) which stated that Peer assessment helps to ensure a quality education for all learners. The outcome of this study was also in contrast with the finding of Adigun (2015) whose study revealed that peer assessment had no gender bias in terms of improving students' academic achievement. In the same manner, Danjuma (2015) also observed that the gender gap between male and female students' in their academic achievement in Basic Sciencewere closing up.

V. Conclusion

The finding of the present study revealed that peer assessment has a significant effect on students' academic achievement in Basic Science more than teacher assessment. Also, the findings revealed a significant difference in the achievement of male and female Basic Science students' exposed to peer assessment.

Recommendation

Based on the findings of the present study, the following recommendation were given.

(i) There should be a clarion call for teachers to adopt the peer assessment strategy alongside teacher assessment strategy in the assessment of students' academic achievement in Basic Science.

(ii) It is also advised that future researchers should conduct comparative studies on peer and self-assessment.

(iii) It is recommended that scholars on peer assessment research should diversify units of analyses to include private secondary school institutions since the present study, focused on public secondary school institutions.

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