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QUASI-EXPERIENTIAL STUDY ON EFFECT OF PEER ASSESSMENT ON BASIC EDUCATION STUDENTS' INTEREST AND GENDER DIFFERENCE IN TARABA STATE, NIGERIA

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INTRODUCTION

The teaching and learning of integrated science replaced the general science and was taught in Nigerian schools up to 1980 when the Federal Government restructured the 5-years secondary school system into 6-3-3-4 system. That is 6 years primary Education, 3-years junior secondary school (JSS) Education, 3-years senior secondary school (SSS) Education and 4-years Tertiary Education (FRN, 1981). The teaching and learning of Integrated Science in Nigerian schools especially at the Junior Secondary school level continued till 2009 when the Federal Government of Nigeria restructured Educational System into 9-3-4 system.

Despite the significant place of science to mankind, the learning outcome of student in the science has not been generally encouraging (Oginni, 2013). The poor learning outcome of student in science has continued to be a major cause of concern to all and this depressing situation has no doubt informed so many research effort that has been directed toward identifying the factors responsible for this deplorable condition and what effort are to be made to improve such situation. Among factors that have been identified to be responsible for low learning outcome in Basic Science(s) are poor method of instruction, teacher's attitude, laboratory inadequacy, poor science background, and non-availability of effective teaching and learning resources in the classroom (Bassey, Akpama, Ayang &Iferi-Obaten, 2013). In order to alleviate this problem, more research efforts need to be directed towards the factors responsible for the deplorable condition so as to put learners learning outcome back in track.

All assessments lead to some kind of student learning (Boud, 2010), but a fundamental challenge is to stimulate the right kind of learning. Assessment tasks often distribute effort unevenly across a course and examinations are frequently critiqued for encouraging memorization or surface approaches to learning. Assessment may also fail to support

students in developing dispositions for lifelong learning, such as the ability to self-evaluate. Feedback is often ineffective, principally because it comes too late for students to use it productively and it generally fails to include iterative cycles of feedback and revision that normally characterize academic writing.

One of the core problems is that assessment is about several things at once what Boud (2010) refers to as 'double duty'. It is about grading and about learning; it is about evaluating student achievements and teaching them better; it is about standards and invokes comparisons between individual; it communicates explicit and hidden messages. Its multiple demands make it reform difficult to achieve, but in view of the centrally of assessment to the student experience, it is crucial that the area be handled well. Assessment is defined as a systematic process for gathering data about student achievement is an essential component of teaching (Lan, 2016). The impact of assessment is significantly observable when boys and girls are involved. The way male and female students approach learning determine the way students think about classroom assignments and tests. Recent studies such as Kpolovie (2010), and Boud (2010) advocated for including male and female students in the process of developing peer assessment tools as students' involvement in peer assessment adds more value to the learning process.

The differential attitude of students by gender and by interest is best investigated through the use of Quasi-experiment design, Quasi-experimental design is used as an evaluation tool to determine the effect of a phenomenon such as peer assessment or to isolate a particular caused variable. The differential attitude tends to expose boys more scientific activities very early in life than girls. This attitude also unconsciously suggests to the males the subjects and professions especially meant for males and areas meant for females. Consequently, Kpolovie (2010) noted that one will not be surprised to observe that girls shun the physical sciences and will always be seen in good numbers offering Home Economics, French language and other allied subjects. There is therefore the need to find out the influence of gender on Peer Assessment on Basic Science Students' Academic Achievement.

Interest is an important determinant for successful large scale academic achievement. Students who are interested in their learning activities are likely to report high academic achievement or (academic) performances

as the extent to which a student, has achieved short or long-term educational goals. It is what the student have learned or what skill the student has learnt that is usually measured through assessment which can be in the form of standardized test, performance assessment and portfolio assessment (Santroct, 2009).

Academic achievement refers to a student's success in meeting short- or long-term goals in education. For the purpose of this study, Academic achievement is the extent of score, or grade points recorded by a student after an instructional programme with the teacher for certain period of time. Academic achievement more often than not is found to depend on students interest (Ifeakor, 2006). Interest can be seen as the attitude one has in the cause of wanting to know or learn more about somebody or something. Ifeakor (2006) expressed that interest is an activity or object that can be sustained depending on what the individual whose interest is engaged stands to gain or lose by doing so. Interest is an activity that captivates an individual's attention and spurs him to action. Anekwe (2006) reported that interest from educational or psychological point of view is a motivational construct.

In our everyday experience, schools have been using the available facilities and normal formative assessment procedures to enhance teaching and learning, Peer Assessment Techniques (PAT) has been identified to consist of various cognitive activities. It has been deserved that it improves the cognitive, affective and psychomotor behaviours of the students (Khadijeh, 2010). It is against this background that the present study aimsto determine the effect of peer assessment on student's Interest and Academic Achievement in Basic Science among Secondary School in Taraba State.

STATEMENT OF THE PROBLEM

Some scholars have identified students' poor academic achievement in Basic Science to the fall in the standard of education. Students' achievement in science at all levels especially at the secondary school level has fallen standard of education in Nigeria. Specifically, this fallen educational standard is attributed to method of teaching, non-currency of the teacher, poor teacher made test and conventional teaching methods and as some of the factors responsible for poor academic achievement of students. In 2015, Taraba State recorded 68% pass in Basic Science and by 2016, the total percentage pass, dropped to 58% again, 62% pass in

Basic Science was recorded in 2017, but this figure dropped to 58% in 2018 (source: National Examination Council, 2019. Based on the observed poor achievement in Basic Science result in Taraba State, a number of methods of teaching designed to stimulate students' interest and learning of Basic Science had been suggested and tried out by researchers in Nigeria. However, the use of peer assessment could be a step taken to solve this problem. This is because the role of the teacher in assessment in the past calls for concern.

Purpose of the Study

The main purpose of this study was to find out the effect of Peer Assessment Technique on Students' Interest and Gender Difference in Basic Science among Upper Basic Education Classes in Taraba State, Nigeria. Specifically, the study was set to:

1. Determine the effect of peer assessment on students' interest in Basic Science interest inventory (BSII).
2. Determine the effect of peer assessment on gender in Basic Science interest inventory (BSII).

Research Questions

In order to carry out the study, the following questions were raised:

1. Which of the groups of students exposed to peer assessment technique shows greater interest in Basic Science as revealed in the Basic Science interest inventory test?
2. What difference exists in the mean achievement scores of male and female students exposed to peer assessment in Basic Science interest inventory in Basic Science?

Research Hypotheses

Based on the research questions, the following null hypotheses were tested at 0.05 alpha level of significance.

$H0_1$: The mean interest score of student exposed to peer assessment in Basic Science interest inventory does not differ significantly.

$H0_2$: The mean difference between male and female student exposed to peer assessment in Basic Science interest inventory does not differ significantly.

Review of Relevant Empirical Studies

This section is made up of relevant literature on the variables of the research questions such as peer assessment and students' interest and peer assessment and gender effect on students' interest.

Peer Assessment and Students' Interest

Menu, (2016) investigated the factor affecting Academic Achievement, Interest and Home Environment A study elementary school students of NCR Delhi, Imdia. The foremost aim of the study was to investigate and analysis the relationship of general mental ability, interest and home environment with Academic Achievement, Methods: The participant was 110 students drawn from three Kendrya Vidyalayas of Delhi. Their ages ranged between 13 and 14 with the mean age of 13.6 years. Two validated instrument were used to elicit responses from the participants-general mental ability test prepared by R.K Tandon, multiphase interest inventory of S.K Bawa and Home Environment inventory of K.S Mishra were administered whereas examination grades of class VII were considered as academic achievement. Four major hypotheses were formulated and tested as 0.01 level of significance. Pearson-Moment Correlation Co-efficient and t-test were used to analyze the data. The study reveals that General Mental Ability, Home environment, interest and academic achievement are significantly and positively correlated, whereas the high score of girl indicated that female scores were superior of boys.

Boniface (2018) carried out a study investigated classroom environment and student's academic interest as correlates of achievement in Senior Secondary Chemistry. Correlational design was adopted. 208 SS II students from ten randomly selected public secondary schools in Ibadan Oyo State, Nigeria participated. Instruments for the study are, classroom Environment Students' Questionnaire (r = 0.76), students' Academic Interest Scale (r = 0.81) and Chemistry Achievement test (r = 0.85). Four null hypotheses were tested at 0.05 alpha level of significance. Pearson Product Moment Correlation and Multiple Regression Analysis were used for data analysis. Result showed significant relationships between classroom environment and academic achievement, students' academic interest and achievement in Chemistry. Composite contribution of classroom environment and academic interest was significant. However, classroom environment better predicted achievement than students' academic interest.

Peer assessment and Gender Effect on Students' Interest

Anekwe (2006) carried out a study of effect pf constructivist-based instructional model (CBIM) on student interest and achievement in French language in Anambra state. His purpose was to find out which instructional method the CBIM and teacher centered method (TCM) could boost student's interest in French language, his hypothesis stated that there was no significant ($p < 0.05$) in the mean interest scores of urban and rural students taught with CBIM and TCM. It was a non-randomized quasi-experiment design involving two intact groups. The CBIM and TCM were used on experimental and control group respectively. Analysis of covariance (ANCOVA) was used in analyzing the data. The study revealed that students' taught using CBIM shows significant interest towards French language than those taught using TCM in both urban and rural areas.

Anyaegbu (2000) carried out a study on interest in the teaching and learning of French in the senior secondary schools in Enugu Educational Zone. The study was aimed at identifying the level of interest among student's in senior secondary schools and factors that militate against such interest. The subject includes 460 senior secondary school student offering French in 16 schools in Enugu and Nsukka Education Zone. Documents and questionnaires were used for data collection. Analyzing the data collected, the researcher reported that 95.5% of students who offered French in the junior secondary schools certificates examination (JSSCE) decided to drop the subject. Anyaegbu attributed the mass exodus to great loss of interest in the subject, in further analysis, the researcher reported that inadequate aids, less number of period allotted to French, ill-equipped library, ineffective use of human and material resources were some of the factors he discovered militating against the student's interest in the teaching of French language.

Literature reviewed in this section has shown contradictory evidence in teaching method affecting secondary schools student's interest in French language. Akudolu (2010) reported a non-significant difference in student's interest in teaching methods, Anekwe (2006) reported a significant difference in student interest in other teaching methods, it was also noted that inadequate availability of human and material resources contributed to low of student's interest in French. Since none of the research was conducted on assessment technique, there is the need to

find out the influence of peer assessment Technique (PAT) on student's interest in French.

Research Design

The Quasi experimental research designed was employed for the study. The design is the non-randomized control-group pre-test design involving two groups; the experimental group and the control group subjects in the groups were not randomly assigned to group rather intact classes were randomly assigned to experimental and control groups.

Pre-test – Post – test group design

A	**O**	**X**	**O**
B	**O**		**O**

It is experimental research because it is expected to establish the cause effect relationship between the use of BSAT as an instructional/assessment method and traditional assessment technique that is mostly used in all schools on students' academic achievement. Quasi-experimental design is a school-friendly type of design in that it can be used in schools without any major disruption to the school's class structure or timetable of academic events. Gender served as the moderator variable. Interest inventory was used to measure the effect of BSII on students' interest in Basic Science.

Sample and Sampling

Simple random sampling was used to select Jalingo Education Zone in Taraba State. Simple random sampling technique was also used to select six (6) Upper Basic Education schools from thirty six (36) public secondary schools in Jalingo Educational Zone in Taraba State, Agnieszka, (2012). There are thirty six (36) Upper Basic Education schools in Jalingo education zone with qualified and experienced Basic Science teachers. Six (6) co-educational schools were randomly sampled from the three (3) Local Government Areas making up Jalingo Education Zone using balloting. Three (3) schools, one: (1) from each local government area formed the experimental group while three (3) schools: one (1) from each local government area formed the control group, total sampled were 333 students/respondents (experimental group – 152 students while control group – 181 students). Using co-educational schools enabled the researcher to obtain a true record of gender interaction, in the sampled schools, all the Upper Basic Education 2 (JS2)

students in the intact classes randomly selected belong to one group and thus receive the same treatment. Each sampled schools (intact class) were assigned either to a control or treatment condition using the balloting technique.

Instrumentation

The two instruments used for data collection were the Basic Science Achievement Test (BSAT) and Basic Science Interest Inventory Test (BSII). These instruments were developed by the researcher. Then BSAT is a 50 items, 5 options multiple-choice objective test lettered A-E. One of the options was the correct answer based on some Upper Basic Education (JS2) Basic Science topics. One mark was given to a correct answer and no mark for the wrong answer or choice of more than one answer for a question. The sampled students accepted the questions in each of the test. The items measured only objectives in the cognitive domain of Bloom's taxonomy of educational objectives. Table of specification was used in generating the BSAT items. The test scores represent the true index of the level of proficiency and of the realization of the instructional objectives. The test blue-print eliminates the tendency of overloading the test with items that cover only limited subject-matter or objectives. Thus, the content validity of a test is inherent in the test blue-print. The questions covered the knowledge, comprehension, application and other levels. Structured test items were used for test and re-test experimental design to establish information on student's achievement in Basic Science.

The BSAT was divided into two sections; section A contained questions on students' personal information for demographic analysis of the sampled population. Section B contained test items in Basic Science Achievement Test constructed by the researcher using the information obtained from the school's Basic Science teachers who are experts in the subject and had been teaching the subject for a period of not less than 10years. The researcher administered the prepared Basic Science Achievement test item to both experimental and control group first as pre-test. The researcher marked the scripts for both groups. The researcher exposed the experimental group to the marking of each other's scripts that is, the points to look out for and mark (s) to be awarded for the point identified as indicated in the guide. The training covered a period of 4 weeks. After four weeks the same Basic Science Achievement Test was re-administered to both the Experimental and control groups.

The researcher marked the scripts for the control while the training group members were made to exchange their scripts and mark each other using the marking guide prepared for the test. The researcher later checked the script of the experimental group members to confirm the score awarded by the peers. The result of participants in the pre-test and post-test Basic Science Achievement Test was collected for analysis to be able to see the effect of Peer Assessment on the academic achievement of both groups in the subject.

Section C is the BSII questionnaire that presented statements on influence of peer assessment on students' interest in Basic Science where respondents were required to indicate their interest for or against. BSII elicited information of students' interest in Basic Science. The BSII is a 23 item interest scale; it has a 4 point modified Likert-type response scale. The respondents indicated their degree of agreement or disagreement on a number of statements about Basic Science in general. For positive items: strongly Agreed (SA) = 4 points; Agreed (A) = 3 points; Disagreed (D) = 2 points and Strongly Disagreed (SD) = 1 point. For negative items: Strongly Agreed (SA) = 1 point; Agreed (A) = 2 points; Disagreed (D) = 3 points and Strongly Disagreed (SD) = 4 points. The BSII dealt with questions that probe student's interests, attitudes, appreciation, emotional biases and values. The instruments were developed by the researcher.

Validation of Instrument

The BSAT was subjected to face and content validations. For the face validation, the researcher gave the draft of the BSAT with the table of specification to the researchers' supervisor, and other lecturers in the Faculty of Education, Taraba State University for their inputs. Their judgments regarding the content validity of the area of interest and clarity of items were considered for the final selection of the items. For content validity, the experts agreed that the test items had high content validity since the topics were selected from the Basic Science syllabus for Upper Basic Education (JS2). The draft of BSII was also subjected to face and content validity. The BSII was vetted by the experts and the vetting resulted in the modification of some of the items.

The lesson plans were also validated by two experts in measurement and evaluation and two Upper Basic Education schools' Basic Science teachers. Response from these experts confirmed that the instrument has

high validity since the items and mode of instruction are patterned according to Basic Science curriculum.

Reliability of Instruments

The developed instrument was administered to intact class of 60 students of GDSS Capital in Yola North Local Government Area of Adamawa State. The school selected for the pilot testing was outside the sample schools for the main study but are similar with the sample schools. The research instruments were pilot tested using an equivalent intact class of sixty (60) Basic Science. Upper Basic Education student from GDSS Capital in Yola North Local Government Area of Adamawa State. The respondents were given 1hrs 30min to attempt all the items. The reliability of internal consistency of BSAT was determined using the Kuder Richardson formula 20(K – R20) technique. The Kuder and Richardson formula 20 (KR20) was used to estimate the reliability of binary measurements, to see if the items within the tests obtained the same binary (right/wrong) results over a population of testing subjects (Ajai&Amuche, (2015) &Emaikwu, (2015).

The procedure helped to establish the internal consistency of the BSAT items. The 50 items of the BSAT was administered on 60 Upper Basic Education 2 (JS2) students, the scores were used to compute the coefficient of internal consistency of BSAT. The reliability index of r = 0.93 was obtained as the computation shows that the BSAT instrument used in this study is considered highly reliable. The reliability of internal consistency of BSII was ensured using the Cronbach alpha procedure. Cronbach's alpha is a measure used to assess the reliability, or internal consistency of a set of scale or test items. In other words, the reliability of any given measurement refers to the extent to which it is a consistent measure of a concept. Cronbach's alpha is computed by correlating the score for each scale item with the total score for each observation (usually individual survey respondents or test takers), and then comparing that to the variance for all individual item scores (Ajai&Amuche, 2015). The students' response was used to compute the coefficient of internal consistency of BSII and the result was 0.79.

Method of Data Analysis

The data collected from the pre-test, the post-test and the interest inventory of both groups were analyzed by subjecting the results to statistical procedure of descriptive statistics of mean, standard deviation

and inferential statistical of Analysis of Covariance (ANCOVA). The pretest scores were used as covariates or control measure to post-test scores. ANCOVA was appropriate because it served as a procedure for controlling the initial differences across the groups as well as increase the precision due to the extraneous variables thus reducing error variance and nullifying distortions arising from regression of scores of subjects between their pre-test and post-test scores, as well as the nullification of the effect of reactive arrangement of subjects who will be reacting more to the newness of treatment condition rather than on the actual treatment itself (Ali, 2006). The null hypotheses were tested at 0.05 level of significance. Agnieszka, (2012) stated that ANCOVA is appropriate in taking care of initial group differences statistically.

Data Presentation, Analysis and Interpretation

Research Question 1

Which of the groups of students exposed to peer assessment technique show greater mean interest score in Basic Science as revealed in the Basic Science interest inventory test?

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Table 1

Means and Standard deviation of Pre-test and Post-test scores of students in BSAT by treatment and gender.

		Gender			Gender		
		Pretest	pretestpost test		post test		
Treatment		Male	Female	Overall mean	Male	Female	Overall mean
Experimental (BSII)	Mean	53.5930	48.7663	53.4934	63.8721	65.1977	63.4868
	SD	3.00736	3.93058	3.01431	4.07517	3.57332	4.07705
	N	86	66	152	86	86	152
Control (TAT)	Mean	44.2311	53.3636	55.9669	57.0663	62.9848	53.4254
	SD	4.22220	3.04144	36.59628	4.32556	4.05536	5.17056
	N	86	66	181	86	66	181

Table 1 showed that the students assessed using BSAT recorded higher overall mean interest score of 63.4868 with a standard deviation (SD) of 4.07705 while students taught using TAT had a less overall mean interest score of 53.4254 and a SD of 5.17056. It seemed that the experimental group (BSAT) showed more interest in Basic Science than the control group (TAT) as indicated in their overall mean interest score in BSII.

Research Question 2

What difference exists in the mean achievement scores of male and female students exposed to peer assessment technique in Basic Science interest inventory in Basic Science?

The post interest mean score of the female students in the experimental (BSAT) group was 65.1977 with a SD of 3.57332 while that of male students was 63.8721 with a SD of 4.07517. On the other hand, the post interest mean score of the female students in the control group (TAT) was 62.9848 with a SD of 4.05536 while that of the males was mean interest score 57.0663 and a SD of 4.32556.

Hypothesis One

$H0_3$: The mean interest score of student exposed to peer assessment techniques in Basic Science Interest Inventory does not differ significantly.

Table 2
Analysis of Covariance (ANCOVA) of students' overall Post Interest mean scores in BSII (Assessment Techniques and Gender)

Source of Variation	Sum of squares	Df	Mean square	F calculated	Sig. of F	F table
Corrected model	414231.2	4	8855.36	4.09	.00	
intercept	15112.45	1	12070.25	5.22	.01	
pretest	13288.21	1	12996.91	4.13	.01	
Sex	2820.71	1	2820.71	1.73	.19	3.96
Treatment	16743.83	1	13343.06	3.37	.01	3.96
Sex x treatment	3323.81	1	4823.30	1.79	.15	3.96
Error	384387.61	153	2128.76			
Total	1223588.00	149				
Corrected Total	521711.06	152				

The F calculated for assessment technique was 3.37 against the critical value of 3.96 at the 0.05 level of significance, 1 df for numerator and 241 df for denominator. Since the calculated value is less than the critical value, the null hypothesis of no significant difference in the mean interest scores was not rejected. It is therefore inferred that effect of peer assessment technique (BSAT) on students' interest in Basic Science is no significant.

Hypothesis Two
$H0_2$: The mean difference between male and female student exposed to peer assessment techniques in Basic Science Interest Inventory does not differ significantly.

Table 2 shows that the F ratio calculated was 3.37 against a table value of 3.96 at the 0.05 level of significance difference on the effect of gender in the mean interest was not statistically different from the male students' interest.

DISCUSSION OF FINDINGS

The discussion and interpretation of results presented in the study is organized under the following.

(i) The effect of assessment techniques (BSAT and TAT) on interest in Basic Science.
(ii) The influence of gender on interest in Basic Science.

The study has revealed that students taught using Peer Assessment Technique (BSAT) showed significant interest in Basic Science language than those taught using Teacher Assessment Technique (TAT). The finding of this study in respect to students' interest with regards to assessment technique agrees with that of Agbaegbu (2011), who observed that the main interest scores of students in the peer assessment group was greater than the mean interest score of students' in the teacher assessment group. Similarly, the present findings was in confirmation of Boniface (2018) study on the classroom environment and academic interest as a correlate of Achievement in Senior Secondary Schools chemistry according to Boniface, there is a significant relationship between students' academic interest and students' academic achievement in chemistry.

The study revealed that gender was not a significant factor n students overall interest in Basic Science language. Though the female students tended to show more interest than their male counterparts, their better interest ratings were not statistically different. This finding is in consonance with that of Anekwe (2006) in which he reported that students' interest in Basic Science was significantly independent of sex. However, it appeared to contradict the findings of Anaekwe (2012) and Muraya&Kimamo (2011) who reported statistically significant effect of gender on students' development of interest in chemistry and Biology respectively. They noted that female students showed greater interest than male students.

The interaction effect of treatment and gender on students' overall cognitive achievement in Basic Science was not significant. This is in agreement with the findings of Agbaegbu (2015) in which he reported that the combined effect of assessment technique and gender on overall cognitive achievement in Chemistry and Geography respectively were not significant. However, this disagrees with Udousoro (2011) who found a significant interaction effect between gender and assessment technique on students' achievement in chemistry.

On the combined effect of peer assessment technique and gender on students' interest in Basic Science, there was no significant effect. This conformed to Agbaegbu (2015) who found the combined effects on BSAT and gender on students' interest towards Geography not significant. This meant that the efficacy of BSAT on students' interest was consistent across sex levels.

CONCLUSION

The study had shown that BSAT has positive effect on students' cognitive achievement and interest in Basic Science. The BSAT enabled students to learn more Basic Science grammar than their counterparts who were using the TAT. The influence of gender on cognitive achievement in Basic Science was not significant though the female students tended to exhibit superior achievement over their male counterparts. The combined effects of BSAT and TAT gender on students' cognitive achievement and interest were not significant. Both male and female students demonstrated equal level of achievement and interest in the BSAT.

RECOMMENDATIONS

The following recommendations were made in view of the foregoing implications of the findings of this study.

Basic Science teachers and educational administrators should introduce BSAT into class works to alternate or supplement the usual teacher assessment technique. So as to sustain students interest in Basic Science.

The Ministry of Education in Nigeria should organize seminars, workshops and conferences for Basic Science teachers on how to use BSAT in teaching and evaluating students of Basic Science. The same ministry of education should consider adopting BSAT for the purpose of promoting gender equality in Basic Science classroom.

Suggestions for Further Study

The limitations of this study have generated some areas for further research.

1. The present study should be replicated using another education zone or a wider geographic area, if possible the whole of Taraba state;
2. Further studies should identify the combined effect of peer and teacher assessment techniques on ability levels of cognitive achievement and interest in Basic Science.

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