

EFFECT OF SELF AND PEER ASSESSMENT TECHNIQUES ON SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN GRAPH CONTENTS OF ECONOMICS IN NNEWI EDUCATION ZONE

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Abstract

The study investigated the effect of self and peer assessment techniques on secondary school students academic achievement in graph contents of Economics in Nnewi Education Zone. Two research questions and two null hypotheses guided the study. This study adopted non-equivalent quasi-experimental control group research design. The population of the study was all the 2134 (837 were males and 1297 were females) senior secondary schools two (SSS II) students in all the 50 public secondary schools in Nnewi Education Zone of Anambra state who are offering Economics as an elective subject in 2020/21 academic session. This study employed a multi-stage sampling procedure for the sample of 4 schools and 105 (47 male and 58 female) students for the study. The instrument used for data collection was Achievement Test on Graph Contents in Economics (ATGCE). The face validated was done by three experts. The scorer reliability of the ATGCE was established using Kendalls' coefficient of Concordance and the coefficient of 0.82 was obtained. The data were analyzed using mean and standard deviation for research questions while hypotheses were tested using ANCOVA at 0.05 level of significance. The findings amongst others showed 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. Based on the findings and conclusions, it was recommended that Economics teachers should embrace the two assessment techniques.

Keywords: assessment, graph contents, self and peer assessment techniques

Introduction

In the Nigerian secondary school system, Economics stands out as one of the subjects of learning in the formal education setting that has an essential role in cultivating the consciousness of the learner towards the role of education as a tool for sustainable economic growth and development. Eze (2017) viewed Economics as a social science that studies human behavior as a relationship between ends and scarce means which have alternative uses. Economics is defined as the discipline that develops conceptual models of behavior to predict responses to changes in policy and market conditions and uses statistical analysis to study such changes (Jana, 2018). It is one of the social science subjects that focuses on the creation, allocation, and utilization of goods and services, and analyzes the choices that persons, businesses, governments, and nations make to assign resources.

Economics is one of the elective subjects offered in the Nigerian senior secondary school for achieving the national educational objectives in the areas of economic growth and development as stated in the National Policy on Education. The important and knowledge of Economics is useful to the individual households, firm and government for making decisions that will eventually improve the standard of living and make careful and effective management

of scarce resources. In order to achieve these, it becomes necessary to have high academic achievement in Economics at secondary school since this level of education is the starting point of teaching and learning of the subject.

Achievement means anything somebody has done successfully using his or her own effort and skill. Kulbir (2005) defined achievement as the measurement of the effect of specific programme of instruction or training. Academic achievement is performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university (Steinmayr, Meibner, Weidinger & Wirthwein, 2014). It is the attainment of a certain level of an existing benchmark in order to show the level of proficiency level in a particular field of knowledge or skill. Despite the important of Economics, the achievement of students in internal and external examinations has not been encouraging (Yahya & Bosede, 2019). According to West African Examination Council (WAEC) Chief Examiner's report from 2016 to 2022, there was poor achievement of students in West African Secondary School Certificate Examinations (WASSCE) in Economics.

The decrease according to the Chief Examiner's report is as a result of the great number of candidates showed great deficiency in the application of graphical representations despite knowing that graph content is a broad area and question likely comes out from it. Economics as a school subject, Arsaythamby and Julinamary (2015) were on the opinion that the learning of Economics requires the mastery of mathematical concepts, in theory, problem-solving and graphs. Muhammad. Bala and Ladu (2016) explained that Economics involves topics such as the use of tables, charts, diagrams and graphs. The authors further stated that students who study Economics in senior secondary schools generally face difficulties in mastering economics skills that involve mathematical and graphing elements. Therefore, graphical illustration is an essential instrument in the learning and understanding of Economics concepts. Graph is a quantitative approach used in teaching of Economics concepts (Veloo & Md-Ali, 2014). It is an essential tool in Economics analysis that provides readable information about the trend of economic data. According to Ande (2015) graph shows the functional relationships between two variables, this according to the author includes graphs, pie charts, bar charts, and pictograms. A graph is a diagram that systematically represents the connections that exist between two or more quantities through the use of bars, dots and lines (Ede & Oleabhie, 2020). It is a diagram that has x and y axes which indicate the relationship between two variables. Since great number of students show deficiency in application of graph, it becomes necessary to investigate the best assessment technique for graph contents in Economics for classroom teachers.

Assessment is an orderly process of collecting, arranging and analyzing data for improvement of teaching and learning. According to Nworgu (2015) assessment is a systematic way of gathering data about students' learning from a variety of sources in order to aid students' learning and improve instruction. Nworgu further stated that assessment can be either summative or formative. When the purpose of assessment is to understand and describe contents, it is referred to as summative assessment while when it is to improve learning; it is referred to as formative assessment. Capraro, Roe, Caskey, Strahan, Bishop, Weiss and Swanson (2012) viewed summative assessment as been used to capture the results of students' achievements within a specified time frame and often occur at the end of an academic year as schools and districts administer mandated and standardized tests to determine annual yearly progress. It is an assessment carried out at the end of a term, semester or at the end of academic session to determine what the students have learnt. Vingsle (2014) defined formative assessment as a systematic process to continuously gather information and provide feedback about learning while instruction is on-going. Formative assessment is a planned process in which assessment elicited evidence of student's status is used by teachers to adjust their

ongoing instructional procedures or by students to adjust their ongoing present learning procedure. It is a kind of assessment which might involve a teacher and the students. When it involves a teacher, it is referred to as teacher assessment but when it involved the students, it could be self-assessment or peer assessment.

Self-assessment as a formative assessment can be use by secondary school teachers in checking the progress of the instruction in order to make adjustment on the weakness areas of the students. It is a learning tool for students for better conceptual understanding of additive and subtractive colour mixing (Noona, 2005). It is that kind of assessment where a student takes charge of his or her assessment by grading the scripts by himself in order to determine the content areas that needs improvement. Osmond (2015) stated that engaging students in self-assessment can help them in learning to evaluate their own learning and in interpreting assessment criteria. Peer assessment on the other hand is a situation where students grade the script of fellow students. Azarnoosh (2013) explained that self and peer assessment can serve the same purpose of teacher assessment and also change learners' perspective towards types of assessments, and may also lead to good learning outcomes. Alqassab and Panadero (2018) was on the opinion that peer assessment is an educational activity in which students' judge the performance of the fellow students. The implication is that if self and peer assessments are properly applied in the classroom assessment, it could improve students' academic achievement in graph contents which could eventually improve achievement in Economics.

Some studies have been conducted on self and peer assessments. A study according to Price (2016) on the effect of self-assessment strategy on the academic performance of students in Mathematics, the result of the study showed that students who were taught using self-assessment strategy had a significantly higher level of academic performance than those who received a tutored-assessment strategy; also gender has no significant influence of students' achievement. Sharma, Jain, Gupta, Garg, Batta, and Dhir (2016) investigated the impact of self-assessment on medical students learning in India showed that self-assessment had a positive effect on the learning of students. Vasileiadou and Karadimitrioub (2021) on a study examined the impact of self-assessment with the use of rubrics on primary school students' performance found out that students' self-assessment has a positive effect on students' school performance, especially in writing.

Few studies were done on peer assessment. Eze (2009) conducted a study on the effects of peer assessment technique (PAT) on students' cognitive achievement and interest on secondary school students in French in Onitsha Education zone of Anambra State found out that there was significant effect of PAT on students' achievement in French. In another study, Khonbi and Sadeghi (2012) on effect of self, peer and teacher assessment on Iranian undergraduate English revealed that peer assessment is more effective, followed by teacher assessment and finally self-assessment. Asuai and Adeleye (2013) on a study on the impact of peer assessment on performance in Mathematics among Senior Secondary School Student in Delta State found out that there was a positive impact of peer assessment on achievement and also there was significant difference in peer assessment test among participants exposed to the training conditions. Study of Alzaid (2017) on the effect of peer assessment on the evaluation process of students in Department of Psychology at King Saud University revealed that there was positive significant relationship between peer and teacher assessments. The study of Alzaid used Pearson Product Moment Correlation for data analysis when the study was experimental study instead of mean and standard deviation for the research questions, ANCOVA for hypotheses. There is need for this study. Besides none of the reviewed study studied the joint combination of self and peer assessment techniques on graph contents of Economics in Nnewi Education zone despite the Chief Examiner's report on the topic. This poor achievement does not exclude the students in Nnewi Education Zone which forms part of the areas in Nigeria that participate in the nationwide WASSCE.

Moreover, there are male and female students in the public secondary schools in this zone who participate in the nationwide examination, therefore, it becomes necessary to study gender as a moderator variable in order to determine the mean achievement score of male and female on the assessment techniques which none of the previous study investigated. Gender can be defined as the biological feature of being male or female and its moderating influence to students' academic achievement has been of great concern to education practitioners, psychometrics and policy makers (Owan, 2020). It is the distinction between being a male and a female with respect to the range of physical, biological and behavioral characteristics which is capable of influencing the effect of self and peer assessments on students' achievement. Adediwura (2012) in a study on effect of peer and self assessment on male and female students' self-efficacy and self-autonomy in the learning of Mathematics discovered that while there is no significant relationship between gender and enhancement of self-efficacy as a result of students' engagement with the use of peer and self assessment, the enhanced students' learner autonomy that was noticed in the sampled students was significantly influenced by their gender. Oren (2012) investigated the effects of gender and previous experience on the approach of self and peer assessment: A case from Turkey found out that female students received significantly higher mean scores than male students in all score types in terms of the gender variable. Ocampo, Panadero, and Diez (2022) studied are men and women really different? The authors revealed that the effects of gender and training on peer scoring and perceptions of peer assessment view supplementary material revealed that regardless of the training condition, men and women assessors did not differ in their peer scores of men and women peers. From the articulated problem and statements above, the study investigated the effect of self and peer assessment techniques on academic achievement of secondary school students in graph contents of Economics in Nnewi Education Zone of Anambra State.

Research Questions

The following research questions were designed to guide the study:

1. What are the mean achievement scores of students assessed graph contents of Economics with self assessment technique and those assessed with peer assessment technique?
2. What are the mean achievement scores of male and female students assessed in graph contents of Economics with self assessment technique and those assessed with peer assessment technique?

Hypotheses

The following null hypotheses were formulated and tested at $p \leq 0.05$ level of significance:

H₀₁: There is no significant difference in the mean academic achievement scores of students assessed in graph contents of Economics with self assessment technique and those assessed with peer assessment technique.

H₀₂: There is no 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.

Methods

This study adopted non-equivalent quasi-experimental control group research design. This is according to Nworgu (2015), this designed is used where random assignment of subjects to experimental and control groups is not possible. The population of the study targeted all the 2134 senior secondary schools two (SSS II) students in all the 50 public secondary schools in Nnewi Education Zone of Anambra state who were offering Economics as an elective subject in 2020/21 academic session. The government/public co-educational schools were selected for

use in this study because of their homogeneity in terms of the curriculum, school and teacher variables. Out of 2134 SS 2 Economics students, 837 were males and 1297 were females. This study employed a multi-stage sampling procedure for the sample of 4 schools and 105 (47 male and 58 female) students for the study. At the first stage, simple random sampling technique (balloting without replacement) was used to draw two Local Government Areas (L. G. As.) out of the four L. G. As. in the zone. This was done by the use of folded paper and it was to ensure that every L. G. A. is given a fair chance of being selected. At the second stage, purposive sampling technique was used to sample only the co-educational (mixed) schools in the two L. G. As. drawn. At this stage, 29 mixed schools were selected. This technique was adopted because gender was a variable in this study. At the third stage, simple random sampling technique (balloting without replacement) was used to draw two schools in each of the two L. G. As. making it a total of four schools. This was done by the use of folded paper and it was to ensure that every school is given a fair chance of being selected. At the fourth stage, simple random sampling technique was used to assign the two schools in each L. G. A. into group. This was done by the use of coin and it was to ensure that the two experiments were being carried out in each L. G. A. At the fifth stage, simple random sampling technique (balloting without replacement) was used to draw one arm/stream in each school selected. Finally, all the students in the arm/stream drawn were used thereby intact class was used. The reason for the intact class was to make sure no student was left out to avoid disturbance of the school classes/calendar. The selected intact classes comprised of 57 students (Males=26 & Females=31) for self assessment technique class and 48 students (Males=21 & Females=27) for peer assessment technique class.

The instrument used for data collection was Achievement Test on Graph Contents in Economics (ATGCE). The five (5) essay item on ATGCE which covered the period of five (5) times instruction and assessment were developed by the researchers from the following topics/content areas of graph contents in Economics: tools of economic analysis, concept of demand and supply, production possibility curve, cost concepts, and revenue concepts. One essay item on each topic and assessment was done after each instruction on the same lesson plan on the topics of graph contents, this was to ensure that these assessment techniques were effectively utilized. ATGCE has two sections (A & B) with Section 'A' elicits for demographic data of the respondent (Name of School, Class, Identification number & Gender), while Section 'B' which carried 20 marks (with sequential/analytical mark on each step) was composed of one essay item attached with writing paper and graph sheet (if need be). The total score for the five times (five items) assessment was 100 marks. The ATGCE was used on the two groups at pre-test, and post-test. Face validation of the instruments (ATGCE and assessment plans of the two groups) were done by three experts; two from the Economics Education unit (Social Science Education Department) and one from the Research, Measurement and Evaluation unit (Science Education Department), all from the Faculty of Education, University of Nigeria Nsukka. The scorer reliability of the ATGCE was established using Kendalls' coefficient of Concordance and the coefficient of 0.82 was obtained. Training was done at two different sessions (for the two self assessment teachers and for the two peer assessment teachers) by the researchers using the assessment plan and training manual. The ATGCE instrument was administered by the regular teacher as pre-test and post-test after each instruction of each topic (peer assessment group made sure that the peer assessed the same script). It was collected and returned to the researchers immediately to avoid any loss. The data collected were analyzed using mean and standard deviation for the research questions while the hypotheses were tested using analysis of covariance (ANCOVA) at 0.05 level of significance. If the p-value is less than 0.05, then the null hypothesis was rejected and accept alternative hypothesis but if it is greater than 0.05, the null hypothesis was rejected.

Results

Table 1: Means and standard deviation of students assessed graph contents of Economics with self assessment technique and those assessed with peer assessment technique

Groups	N	Pretest		Posttest		Mean Gain
		Mean	Std. Deviation	Mean	Std. Deviation	
Self Assessment	57	8.38	4.32	9.46	4.32	1.08
Peer Assessment	48	9.03	4.68	10.77	5.88	1.74

The result in table 1 shows the mean achievement scores of students assessed graph contents of Economics with self assessment technique and those assessed with peer assessment technique. The result reveals the pretest mean achievement score of 8.38 and 9.03 with a standard deviation of 4.32 and 5.88 for the students assessed graph contents of Economics with self assessment technique and those assessed with peer assessment technique respectively. With a posttest mean score of 9.46 and 10.77 with a standard deviation of 4.32 and 5.88 for students assessed graph contents of Economics with self assessment technique and those assessed with peer assessment technique respectively. The mean difference of 1.08 for Self Assessment Technique shows a little difference in Self Assessment technique on the students; whereas the mean difference of 1.74 shows that there was a positive effect of Peer Assessment on students' achievement. This is an indication that students perform high when they are assessed by their peers than when they assess themselves.

Table 2: Analysis of Covariance on the difference difference in the mean academic achievement scores of students assessed in graph contents of Economics with self assessment technique and those assessed with peer assessment technique

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	82075.627 ^a	4	20518.907	98.829	.000	.798
Intercept	23180.828	1	23180.828	111.651	.000	.528
Pretest	657.741	1	657.741	3.168	.078	.031
Group	81276.064	1	81276.064	391.467	.000	.797
Gender	95.020	1	95.020	.458	.500	.005
Group * Gender	99.810	1	99.810	.481	.490	.005
Error	20761.935	100	207.619			
Total	225513.000	105				
Corrected Total	102837.562	104				

a. R Squared = .798 (Adjusted R Squared = .790)

Result in table 2 shows that an F-ratio of 391.467 with an associated probability of 0.000 was obtained for the difference in the mean achievement score of students assessed in graph contents of Economics with self assessment technique and those assessed with peer assessment technique. Since the associated probability level of 0.000 is less than 0.05 set as benchmark for decision making, the null hypothesis was found to be significant. Hence the null hypothesis which states that the difference in the mean achievement score of assessed in graph contents of Economics with self assessment technique and those assessed with peer assessment technique is not significantly different was rejected. This means that there is a significant difference in the mean achievement score of students assessed in graph contents of Economics with self assessment technique and those assessed with peer assessment technique.

Table 3: Mean and Standard deviation of the achievement scores of male and female students assessed in graph contents of Economics with self assessment technique and those assessed with peer assessment technique

Group	N	Gender	Pretest		Posttest		Main Gain
			Mean	Std. Deviation	Mean	Std. Deviation	
Self Assessment	27	Male	8.10	4.53	9.26	4.44	1.16
	30	Female	6.67	4.23	9.13	4.21	2.46
Peer Assessment	20	Male	10.31	4.48	12.23	6.97	1.92
	28	Female	8.52	4.69	10.48	5.83	1.96

The result in table 3 shows the mean and standard deviation of the achievement scores of male and female students assessed in graph contents of Economics with self assessment technique and those assessed with peer assessment technique. The result reveals the pretest mean score of 8.36 and 6.67 with a standard deviation of 4.53 and 4.23 for male and female students assessed in graph contents of Economics with self assessment technique respectively and a posttest mean score of 9.26 and 9.13 with a standard deviation of 4.44 and 4.21 for male and female students assessed in graph contents of Economics with self assessment technique respectively. The result also reveals the pretest mean score of 10.31 and 8.52 with a standard deviation of 4.48 and 4.69 for male and female students assessed in graph contents of Economics with peer assessment technique respectively and a posttest mean score of 12.23 and 10.48 with a standard deviation of 6.97 and 5.83 for male and female students assessed in graph contents of Economics with peer assessment technique respectively. This implies that

there is no effect in the pretest means score of male and female students assessed in graph contents of Economics with self assessment technique but there is a positively high effect in the means scores of male and female students assessed in graph contents of Economics with peer assessment technique.

Result in table 2 shows that an F-ratio of 0.458 with an associated probability of 0.500 was obtained for the difference in the mean achievement scores of male and female students assessed in graph contents in Economics with self assessment technique and those assessed with peer assessment technique. Since the associated probability level of 0.500 is greater than 0.05 set as benchmark for decision making, the null hypothesis was found not to be significant. Hence the null hypothesis which states that there is no 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 was not rejected.

Discussion

The finding of the study revealed that both assessment techniques improve achievement but peer assessment technique was superior to self assessment technique in facilitating students' achievement in graph contents of Economics. The difference in achievement might be because the students in peer assessment were aware that another student may grade his/her scripts, so the student tried to pay more attention in the teaching so as to achieve higher grade. This study confirms earlier views of Price (2016), and Sharma, Jain, Gupta, Garg, Batta and Dhir (2016) who revealed that students who were taught using self assessment strategy had a significantly higher level of academic performance than those who received a tutored-assessment strategy. This finding also agreed with the findings of Sharma, Jain, Gupta, Garg, Batta, and Dhir (2016), and Vasileiadou and Karadimitrioub (2021) that self-assessment had a positive effect on the learning of students. The findings of Eze (2009), Khonbi and Sadeghi (2012), Asuai and Adeleye (2013) and Alzaid (2017) agree with this result that peer assessment is more effective, followed by teacher assessment and finally self assessment.

The finding revealed that mean achievement scores of male and female students assessed using self assessment technique and their counterpart assessed using peer assessment technique is significant. This is an indication that there was gender bias in using the two assessment techniques. The finding agreed with the study of Adediwura (2012) who discovered that sampled students were significantly influenced by their gender when assessed with the two assessment techniques. Oren (2012) found out that female students received significantly higher mean scores than male students in all score types in terms of the gender variable on the approach of self and peer assessment. Ocampo, Panadero, and Diez (2022) revealed that regardless of the training condition, men and women assessors did not differ in their peer scores of men and women peers.

Conclusion

Use of self and peer assessment techniques in graph contents of Economics is effective in increasing Economics students' achievement. Though, the students achieved significantly better in posttest scores, when assessed graph contents in Economics using peer assessment technique than when assessed the graph contents using self assessment technique. The study however, showed there is significant gender difference in students' achievement scores of students assessed graph contents in Economics.

Recommendations

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

1. Teachers should employ the use of peer assessment technique more than self assessment technique when assessing students for effective teaching.
2. Government should organize free in-service training for the teachers on assessment techniques.
3. Government should inculcate peer assessment technique on the curriculum as assessment technique for graph contents in Economics and also provide all assessment materials (writing sheet, graph paper etc) for the teachers and students.

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