EFFECT OF THE USE OF GRAPHBOARD IN THE TEACHING AND LEARNING OF QUADRATIC EQUATION IN SENIOR SECONDARY SCHOOLS

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Abstract: The study investigated the effect of the use of graphboard in the teaching and learning of quadratic equation in senior secondary schools. The study adopted a pre-test - post-test non-equivalent control group quasi experimental design. Two research questions and two null hypotheses guided the study .The purposive sampling technique was used to select a sample of one hundred SS2 students from two co-educational secondary schools out of ii/e coeducational secondary schools in the list of sixteen secondary schools in Onitsha North local government Area in Onitsha education zone of Anambra state. The instrument used collection was Quadratic Equation Essaytype Achievement Test (QEAT) drawn from WASSCE and NECO past question papers .This ensures the accuracy of the test items. The two examination bodies are the approved standard body in-charge of setting secondary mathematics examinations in Nigeria. The reliability H the instrument was determined using test and retest method and the scores correlated using Pearson product moment correlation coefficient with an index of 0.91. The research questions were answered using descriptive statistics while the null hypotheses were tested at 0.05 level of significance using SPSS version 17 for Analysis of Covariance (ANCOVA). The result of data analysis shows a significant difference in the achievement scores in favor of the experimental group. Among other findings, it was revealed that male students exposed to the use of graph board achieved better than their female counterparts. It was recommended that teachers should always make use of graph board in teaching of quadratic equation as an effective method to ensure a student-centered learning environment.

Keywords: graphboard, teaching, learning, quadratic equation, learning environment.

1. INTRODUCTION

Quadratic equation (from the Latin quadratus for "square") is a mathematical concept in Algebra. It is any equation having the form ax +bx +c=0 where x represents an unknown, and a, b, and c represent known numbers with a#0 If a=0, then the equation is linear, not quadratic The number a,b, and c are the coefficients of the equation and may be distinguished by calling them, respectively, the quadratic coefficient, the linear coefficient and the constant or free term. https://www. wikipedia.org/quadraticequation Quadratic equation can also be referred to as a second degree polynomial equation, since the greatest power of unknown is two. In the Nigeria mathematics curriculum for senior secondary schools, the teaching of quadratic equation are introduced through four methods namely factorization, completing the square quadratic formula and graphical method. Of all these method factorization method is the most preferred especially when the quadratic equation is factorable. The completing the square method is adopted in situation where the quadratic equation is not factorable, with a condition that the coefficient of the highest variable unknown must be unity, that is equal to 1). The quadratic formulas 'a' is a derived formula from the general form $ax^2 + bx + c = 0$ where a, b, $c \in \mathbb{R}$ provided a $\neq 0$ using

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completing the square method. Sonerhed cited in Meremikwu and Amoramo (2017) revealed that with this, student can solve the quadratic equation quickly without paying attention to their structure and conceptual meaning, these techniques are only symbolic in its nature since students simply memorizes the procedure and formula to solve quadratic equation as such they have little understanding of the meaning of quadratic equation and do not understand what to do with it and why is it needed. The significant role of knowledge of quadratic equation to science .technology and engineering education requires the use of an instructional material (the graph board) which will help the students to understand the quadratic equation and its necessary areas of application. This is supported by Nnoli and Okafor (2017) who posit that the use of instructional material is best way of guiding the students to learn so that they can adopt the use of real things in real life situation with the aim of bringing the students face to face with the world which education intends to introduce The most effective method is the use of an activity based cum student centered method. This necessitated the study: Effect of the use of graph board in the teaching and learning of quadratic equation in senior secondary schools

2. STATEMENT OF THE PROBLEM

Quadratic equation as an algebraic topic in the Nigeria Mathematics Curriculum is accorded a very important place by the external examination bodies like West Africa Examination Council (WAEC) and National Examination Council of Nigeria (NECO). This is why question item on objective and essay type on quadratic equation is presented yearly to the candidates who registered for the examinations. However, there is evidence in literature that student shy away from answering essay type question on solving quadratic equation using graph which is usually awarded twelve marks on the marking scheme. This is because of the rote -memorization method adopted by the teachers which not only contribute to poor performance, but has created dislike and phobia of mathematics as a subject amongst the students. Thus this study was designed to investigate the effect of the use of graph board in the teaching and learning of quadratic equation.

PURPOSE OF THE STUDY

The main purpose of the study was to investigate the effect of the use of graphboard in the teaching and learning of quadratic equation in senior secondary schools. Specifically the study sought to:

- Determine the mean achievement scores of the student taught quadratic equation using the graph board and those taught without the use of graph board.
- Investigate the effect of the use of graph board on the mean achievement score of male and female taught quadratic equation.

RESEARCH QUESTIONS

The following research question guided the study

- What are the mean achievement scores of student taught quadratic equation using graph board and those taught without the use of graph board?
- What are the mean achievement scores of male and female students taught quadratic equation using graph board.

HYPOTHESES

The following null hypotheses tested at 0.05 level of significant guided the study

Ho₁: There is no significant difference in the mean achievement scores of student taught quadratic equation using graphboard and those taught without the use of graph board.

Ho₂: There is no significant difference in the mean achievement scores of male and female student taught quadratic equation using graphboard.

3. METHOD

The study adopted a pre-test- post-test non -equivalent control quasi-experimental design. This study was conducted in Owerri North Local Government Area of Owerri Education zone of Imo State. A purposive sampling technique was used to select a sample of one hundred senior secondary two students from two out of the five co-education secondary school in the area of study. The co-education schools were selected because gender was a factor in the study.

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The instrument for data collection was Quadratic Equation Achievement Test (QEAT) comprising of two essay type questions drawn from WASSCE and NECO examination question as a standardized test items. The instrument was validated by two experts from the Department of Mathematics in Nwafor Orizu College of Education Nsugbe and Imo State University Owerri. The reliability of the instrument was established to be 0.86 using test- retest methods. The mathematics teachers of the sample schools were used as research assistants. The pre-test was administered to both the control and experiment groups before treatment. The item in the pre-test were re-organized and used as post-test after the treatment was administered to the experimental group which lasted for two week. The scripts were marked and scores collated .Research question were answered using description statistics while hypotheses were tested at 0.05 level of significant using SPSS Version 7.0 for Analysis of Covariance (ANCOVA)

Research Question One: What are the mean achievement scores of student taught the quadratic equation using graphboard and those taught without the use of graphboard?

		PRE-TEST		POST-TEST		
Group	N	X	SD	Х	SD	Mean
						Gain
Experimental	50	29.38	10.26	60.56	16.68	31.18
Group						
Control	50	22.29	9.88	49.80	11.66	27.51
Group						
TOTAL	100	51.67	20.14	110.36	27.34	58.69

 Table 1: mean achievement scores of student taught the quadratic equation using graph board and those taught without the use of graph board?

The result from Table I shows that the mean achievement scores of students taught quadratic equation using graphboard and those taught without graphboard were 60.56 and 49.80 with standard denature of 16.68 and 11.66 respectively in the post test. The experimental group exposed to the use of graphboard performs higher than the control groups which are not exposed to the use of graphboard. The higher standard deviation of the experimental group shows the students' scores to a great extent was scattered around the mean.

Research Question Two: What are the mean achievement scores of male and female

Students taught quadratic equation using graphboard?

Table 2: mean achievement scores of male and female students	s taught quadratic	equation using graph board.
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		PRE-TEST		POST-TEST		
Group	Ν	Х	SD	Х	SD	Mean
						gain
Male	24	29.75	10.92	68.58	13.29	38.83
Female	26	29.03	7.82	53.15	14.16	24.13
TOTAL	50	58.78	20.74	121.73	27.45	62.96

The results from table 2, show that the mean(x) achievement scores of male and female students in the post test were 68.58 and 53.15 respectively with standard deviation (SD) of 13.29 and 14.16. The male student experimental groups achieved higher than their female counterparts.

Hypothesis 1

Ho₁: There is no significant difference in the mean achievement scores of student taught quadratic equation using graphboard and those taught without the use of graphboard.

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SOURCE SUM OF SQUARE	TYPE111	DF	MEAN SQUARESIG	F	SIG.
corrected model	3064.445	2	1532,222	8.011	.001
Intercept	34031.412	1	34031.412	177.934	.000
Pretest	170.005	1	170.005	.889	.348
Instructional strategy	2224.685	1	2224.685	11.632	.001
Error	18552.315	97	191.261		
Total	326100.000	100			
Corrected Total	21616.760	99			
P<.05					

Table 3: Analysis Of Covariance of mean achievement scores of students in the experimental and control groups

The result from table 3 given as (F =11.632, P = .001,) which is less than .05 level of significant showed that the null hypothesis was rejected. Hence the alternative that there is significant difference in the mean achievement scores of students taught quadratic equation using graphboard and those taught without the use of graphboard.

Hypothesis 2

Ho₂: There is no significant difference in the mean achievement scores of male and female student taught quadratic equation using graphboard.

SOURCE	TYPE 111 SUM OF SQUARE	DF	MEAN SQUARE	F	SIG.
corrected model Intercept	3023.198 17882.626	2 1	1511.599 17882.626	7.865 93.045	.001 .000
Pretest	52.096.	1	52.096	.271	.605
Gender	2940.023	1	2940.023	15.297	.000
Error	9033.122	47	192.194		
Total	19543.200	50			
Corrected Total	12056.320	49			
P<.05					

Table 4: Analysis Of Covariance of male and female students exposed to the use of graphboard

The result from table 4 given as (F=15.297, P=000,) which is less than .05 level of significant showed that the null hypothesis was rejected. Hence the alternative was accepted that there is significant difference in the mean achievement scores of male and female student taught quadratic equation using graph board.

4. DISCUSSION

The findings of this study showed a significant difference in the mean achievement scores of students taught quadratic equation using graphboard and those taught without the use of graphboard. This may be because students understand mathematical concepts taught using instructional or concrete materials. This finding agrees with the findings supported by report of Ales in Kieran 2007 and Sonerhed (2009) who posits that presentation of concepts using concrete materials gives more understanding to the students. The study further indicates that there is significant difference in the mean achievement scores of male and female students taught quadratic equation using graphboard. This is not in agreement with Isah, Olurukooba and Usman (2013) who found no significant relationship between male and female in terms of pedagogical skills in teaching the subject. This finding is in line with the findings of Tapia and Mash (2003) in Saidu and Bunyamin (2016) which revealed that instructional materials are essential materials that enhance the teaching and learning process.

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5. CONCLUSION

The results obtained from the analysis of the data obtained in this study led to the following conclusions:

- I. The experimental group exposed to the use of graphboard performs higher than the control groups which are not exposed to the use of graphboard. The higher standard deviation of the experimental groups shows that the students' scores to a great extent was scattered around the mean.
- II. The male student experimental groups achieved higher than their female counterparts.

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