

Effects of Geoboard on the Performance of Junior Secondary School Student in Geometry in Makurdi Metropolis of Benue State

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ABSTRACT

This study investigated the effect of Geoboard on Junior Secondary School students' performance in geometry in Makurdi Metropolis Benue State. Two research questions were asked and answered while two hypotheses were formulated and tested at 0.05 level of significance. The study employed a pretest posttest quasi experimental design. The sample of the study was 40 JSS 1 students. The experimental group was taught Geometry using Geoboard while the control group was taught using the lecture method. Data were collected from both the experimental and control groups using a Geoboard Performance Test (GPT). Data were analyzed using mean, standard deviation and the Analysis of Covariance (ANCOVA). The results reveal that use of Geoboard to teach geometry is more efficient to the lecture method in facilitating students' Performance in geometry. In addition, the Geoboard approach has no significant differential effect on the mean performance of male and females in geometry.

Keywords; Geoboard, Geometry, Gender, and Performance

I. INTRODUCTION

The poor performance of students in public examinations most especially on the concept geometry has been blamed on the wrong choice of teaching methods or pedagogy by teachers. Teaching and learning activities have a lot to do with other variables such as instructional materials, teachers' qualification, school environment variables, and students' factors and so on. Since Mathematics is an abstract subject, when teaching it, concrete thing should be used in impacting idea. Symbols have been used to explain new concept but often children are not sufficiently familiarized with the language and concept we are trying to explain. Adebajo (2009) affirms that the use of instructional materials in teaching and learning of mathematics make students to learn more and retain better what they have been taught and that it also promotes and

sustains students' interest. It also allows the learners to discover themselves and their abilities. Students learn more when they see what they are being taught. There has much concern expressed about the apparent fall in the standard of education at the secondary school level (Adebule, 2010).

Scandrett (2008) defines the Geoboard as being a versatile manipulative that can be used at all levels for teaching and learning about different areas of Mathematics.

Geoboard as an instructional material helps in the cognitive scaffolding strategy that facilitate the extension of knowledge (Solomon and Perkins in McInerney 2002). The use of geoboard in teaching mathematical concept is not in a set sequence and so, it is easy to incorporate it into mathematics units and learning sequence like every tools, notwithstanding, there is a need of the allowance for free play, so that the learners will have the opportunity to exploit and examine with new equipment (Nwogu, 2011).

Gender is also one of such factors to have considerable effects on students' academic performances especially in science subject like mathematics. Adigun et.al, (2015) affirms that Gender is the range of physical, biological, mental and behavioral characteristics pertaining to and differentiating between the feminine and masculine (female and male) population. The importance of examining performance in relation to gender is based mainly on the socio-cultural differences between girls and boys. Abari et.al, (2019) both male and female students can retain high scores in Geometry if the appropriate medium of instruction is applied in the classroom. Lynn (2006) writing on Gender Issues in Gifted Education" stated that "For whatever reason, gifted females may hold poor perceptions of their mathematics and science abilities..."

The following questions are asked to guide the study:

- i. What is the difference in the mean performance score of JSS students taught Geometry using Geoboard and those taught with lecture method?
- ii. What is the difference in the mean performance scores of male and female JSS students taught Geometry using Geoboard.

The following hypotheses are formulated to guide the study and will be tested at 0.05 level of significance.

- i. There is no significant difference in the mean performance scores of JSS student taught Geometry using Geoboard and those taught using lecture method.
- ii. There is no significant difference in the mean performance score of male and female JSS student taught Geometry using Geoboard.

II. METHODOLOGY

The design of this study is quasi-experimental design. Specifically, the Pretest – Posttest non-randomized Control group design

The study was conducted in Makurdi Metropolis of Benue State. Makurdi is the capital of Benue State and it lies on the south bank of Benue river which has an estimated population of three

hundred and fifty-nine thousand six hundred (359,600) and a land mass of 1,269 km² (NPC, 2006). Geographically, on the map it found on Latitude 7^o 441 N and Longitude 8^o 541 E

The population of this study consisted of all the JSS 1 students in secondary schools in Makurdi Metropolis. The sample size for the study is 40 JSS 1 students selected using multistage random sampling technique. The instrument for the study was Geoboard Performance Test (GPT). The instrument was validated and the reliability was determined using Kuder Richardson 20 and the value of 0.764 was obtained, indicating that the instrument was reliable.

The descriptive statistics of mean and slandered deviation was used to answer the research question while the Analysis of Covariance (ANCOVA) was used to test the hypothesis at 0.05 level of significance.

III. RESULT

The Geoboard Performance Test was used to collect data on the effect of Geoboard on the mean performance scores of students. Summary of result for the two groups is presented in Table 1.

Table 1: Mean performance scores of student’s pretest and posttests in Experimental and Control group

Groups	N	\bar{X}	Pretest		Posttest		Mean gain
			SD	\bar{X}	SD		
Experimental group	20	38.33	8.89	73.33	11.85	35	
Control group	20	37.67	7.88	61.00	9.74	23.33	
Total	40						
Mean difference							11.67

From table 1 the mean and standard deviation for the experimental group in the pretest is 38.33 and 8.89 while that of the control group is 37.67 and 7.88 respectively. However, the mean and Standard deviation for the posttest in the experimental and control group is 73.33 (11.85) and 61.00 (9.74) respectively. From the table, the experimental group has a higher mean gain of 35 while the control group had a mean gain of 23.33. And the difference between the experimental group and control group is 11.67in favour of the

experimental group. This implies that the students taught geometry using Geoboard performed better than the students taught geometry with lecture method.

On the effect of Geoboard on the mean performance of male and female students taught geometry using geoboard, data from performance for the Experimental group was separated across the two gender categories. Summary of result is shown in table2

Table 2: The pretest and posttests mean performance scores of gender experimental group.

Gender	N	\bar{X}	Pretest		Posttest		Mean gain
			SD	\bar{X}	SD		
Male	12	40.00	8.53	75.00	11.05	35	
Female	8	35.83	9.39	70.83	13.30	35	
Total	20						

Mean difference 0.00

From table 2 the mean and standard deviation for the male in the pretest is 40.00 and 8.53 while that of the female is 35.83 and 9.39 respectively. However, the mean and Standard deviation for the posttest in the male and female gender is 75.83 (11.05) and 70.83 (13.30) respectively. From the table, the male Students had a mean gain of 35.00 and the female students had a mean gain of 35.00. However, from the results,

there is no difference in the performance of male and female students taught geometry using geoboard as their mean difference tends to be 0.00.

The first hypotheses on the significance of difference in the mean performance score of students across teaching method, the were tested using the Analysis of Co-variance. Summary of the test is presented in Table3.

Table 3: Analysis of Co-Variance (ANCOVA) report for student’s performance’ to compare the effectiveness of the two groups whilst controlling for pretest. homogeneity and normality checks were carried out and some assumptions were met

Sources of Variation	Sum of Squares	Df	Mean Square	F.cal	P-value
Corrected model	3615.81a	2	1807.91	28.23	0.000
Intercept	2029.90	1	2029.90	31.58	0.000
Pretest	2090.59	1	2090.59	32.52	0.000
Group	1385.38	1	1385.38	21.55	0.000
Error	2378.56	37			
Total	186225.00	40			
Corrected total	5994.36	39			

From table 3 the P value for Group is 0.000. the P value = 0.000 < 0.005. thus the null hypothesis is rejected. This means that there is a significant difference between the experimental and control group. This implies that the JSS 1 students taught geometry using Geoboard performed significantly

better and those taught geometry with the lecture method.

The second hypotheses on the significance of difference in the mean performance score of male and female taught geometry using geoboard were also tested using the Analysis of Co-variance. Summary of the test is presented in Table4

Table 4: Analysis of Co-Variance (ANCOVA) report for male and female students taught Geometry using Geoboard overall performance scores.

Sources of Variation	Sum of Squares	Df	Mean Square	F.cal	P-value
Corrected model	1740.56a	2	870.28	15.59	0.000
Intercept	966.91	1	966.91	17.72	0.001
Pretest	1623.73	1	1623.73	28.67	0.000
Gender	0.39	1	0.39	0.007	0.935
Error	959.608	17	56.448		
Total	186225.00	40			
Corrected total	5994.36	39			

From table 4 the P value for gender is 0.935. the P value = 0.935 > 0.05. thus the null hypothesis is accepted. This means that there is a no significant difference between the male and female student. This implies that the JSS 1 male students taught geometry using Geoboard did not perform significantly better than the female students taught geometry using geoboard.

IV. CONCLUSION.

Summary of data analysis presented in Tables 1 – 4 reveal clearly that Geoboard is very effective in facilitating students’ performance in geometry and that there is a significant difference between the mean performance score of students taught geometry using Geoboard and those taught using the lecture method. It is also evident from the findings that the performance of male and female students taught geometry using the Geoboard did

not differ significantly indicating that both males and females benefit equally with the Geoboard. This implies that Geoboard could be used successfully in a mixed classroom without either male or female being disadvantaged.

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