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EFFECT OF LABORATORY PRACTICALS ON UPPER BASIC SCHOOL STUDENTS' ACHIEVEMENT IN GEOMETRY IN UDI LOCAL GOVERNMENT AREA OF ENUGU STATE, NIGERIA

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Abstract: *This study investigated the effect of laboratory practical in upper basic school student achievement in geometry in Udi Local Government Area of Enugu State. The design adopted was quasi-experimental design. The population of the study consists of 1511 Upper Basic Students in 25 Upper Basic School in Udi Local Government Area of Enugu State. The sample was 196 students from two Upper Basic Schools in Udi Local Government Area. The instrument for data collection was Geometry Achievement Test (GAT) which is made up of 20 multiple choice items. Mean, Standard Deviation and Analysis of Covariance (ANCOVA) were used to analyze the data. The findings of this study show that laboratory practical in teaching and learning of geometry enhances students' achievement. Gender difference exists in achievement of male and female students in favour of females. Based on the findings the researcher made the following recommendations: mathematics laboratory should be provided in all schools to make mathematics teaching and learning more effective, mathematics laboratory method should be used in teaching and learning of geometry to increase students' achievement.*

Keywords: *Laboratory, Practical, Achievement, Gender & Geometry*

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Introduction

The place of mathematics in man's way of life and development cannot be over emphasized. Generally, mathematics is a very desirable tool in virtually all spheres of human endeavor, be it science, engineering, industry, technology and even the pure arts and commercial arts. Mathematics is the bedrock of all scientific technological investigations and has provided the route to, modern word of science and technology (Charles- Ogan and Otikor, 2016). Research evidences have shown that mathematics is an essential too, for scientific and technological breakthrough that has led many nations to achieved sustainable economy (Gambari,Shittu,Daramola and Jimoh,2016).

Despite the position of mathematics in the policy of education in Nigeria , WAEC Chief Examiner's report for

the period of 2015-2017 examination have shown a consistent poor academic achievement in secondary school general mathematics examination in Nigeria. WAEC Chief Examiners (2015) further observed that candidates were weak in Geometry of circles and 3-dimensional problems. According to their reports, most candidates avoid questions on 3-dimensional problems when they attempt geometry questions, only few of the candidates showed a clear understanding of the problem in their working. Ityavzua (2019) stated that the poor achievement of the students in mathematics in Nigeria has been linked and attributed to many factors, some of which are: mathematics phobia, students' lack of interest in mathematics, low and poor retention, gender related issues, lack of mathematics teachers, poor students' background in mathematics, death of mathematics laboratories in Nigeria schools among others.

According to Ityavzua (2019), lack of mathematics laboratory in Nigeria school have been identified as a major factor militating against effective teaching and learning of mathematics which in turn causes students' poor achievement in mathematics and geometry in particular.

Mathematics laboratory is a place where student can find a collection of material that helps them to explore the world of mathematics discovery, to learn and to develop an interest in mathematics (Paris, 2017). It is also a place where students explore different mathematical concepts, facts, thoughts, theories using varieties of activities and materials. The use of mathematics laboratory helps to integrate theory and practical work in mathematics teaching and learning.

According to Ogunkunle (2015), use of Mathematics Laboratory strategies helps to:

1. Display mathematical information as avenue for experimentation through practical work.
2. Pool of storage of mathematical materials for easy access.
3. Removing abstractness and increasing effective teaching and learning

Based on the advantages inherent in the use of Mathematics laboratory, one expect that teaching and learning of geometry using the mathematics laboratory should arouse students' interest in Geometry and in turn enhanced students achievement.

Statement of the Problem

Evidence of poor achievement in mathematics and Geometry in particular by upper basic school students pointed to the fact that the most desired technological, scientific and business application of mathematics is not being sustained. This makes it paramount to seek for a strategy for teaching Geometry that will aim at improving its achievement by students.

Insufficient mathematics laboratory and non-use of laboratory techniques in teaching Geometry has been accused as the major factors responsible for poor achievement in Geometry by upper basic school students. Therefore, this study is designed to find out the effect of Laboratory practical on Upper Basic School Students' achievement in Geometry.

Purpose of the Study

The purpose of this study is to investigate the effect of Laboratory practical on Upper Basic School Students' achievement in Geometry.Specifically, the study is designed to;

1. determine the mean achievement scores of students taught geometry with Laboratory practical and their counterpart taught without Laboratory practical.
2. determine the mean achievement scores of male and female student taught with Laboratory practical

Scope of the Study

This study covered effects of Laboratory practical in teaching and learning of geometry and polygons. It was limited to upper basic two school students in three schools in Udi Local Government Area of Enugu State.

Research Questions

This study attempted to answer the following questions:

1. what are the mean achievement scores of students taught geometry with Laboratory practical and their counter parts taught without Laboratory practical?
2. what are the mean achievement scores of male and female students taught geometry with Laboratory practical?

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance:

Ho_1: there are no significant differences in the mean achievement scores of students taughtgeometry with

laboratory practical and their counter parts taught without laboratory practical.

Ho_2: there are no significant differences between the achievement of male and female studenttaught geometry with laboratory practical.

Methodology

The study adopted quasi-experimental design (pretest, post test, non equivalent control group) as a road map for the study.The research carried out the study at Udi Local Government Area of EnuguState, Nigeria. The population of the study consists of 1511 upper basic two students in Udi local government area. This population consists of 679 male and 832 female students in the 25 upper basic schools in Udi local government area.The sample size for the study was 196 students from two upper basic schools. The sample consists of 102 male students and 94 female students.

The instrument for data collection is Geometry Achievement Test (GAT). The test instrument is made up of 20 multiple choice items constructed by the researcher. The instrument was subjected to face and content validity by two mathematics education expert and one measurement and evaluation expert. The reliability of the instrument was ascertained by administering the test to 20 upper basic two students in another local government area (Enugu east). The scores obtained from the test were subjected to analysis with Kuder-Richardson 20 k-r_{20} to ascertain their reliability.The reliability index was 0.92.The data generated from the study were analyzed with mean and standard deviation for answering of the research questions while Analysis of Covariate (ANCOVA) was used to test the null hypothesis at 0.05 level of significant.

Results

Research Question 1: what are the mean achievement scores of students taught geometry with Mathematics laboratory practical and their counter parts taught without?

Table 1:Mean achievement scores of experimental and control group

		Pretest		Posttest		
Group	**N**	**Mean**	**S**	**Mean**	**S**	**Mean Gain**
Experimental	100	13.70	2.809	18.00	1.421	4.3
Control	96	12.40	3.564	15.04	2.393	2.64

Table 1 showed that the mean achievement scores of student taught with laboratory is higher than that of students taught without laboratory practical. The mean gain in achievement of students in experimental group is 4.3 which is higher than the achievements of students in control group which is 2.64.

Research Question 2: what are the mean achievement scores of male and female students taught geometry with laboratory practical?

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Table 2: Mean achievement scores of male and femalestudents in geometry

		Pretest		Posttest		
Gender	**N**	**Mean**	**S**	**Mean**	**S**	**Mean Gain**
Male	102	12.67	3.157	13.15	2.266	0.48
Female	94	14.37	2.977	16.17	2.667	1.80
Mean Diff.		1.7	3.02	3.02		

Table 2 showed that the mean achievement scores of male are lower than that of the female students taught geometry with laboratory practical. The mean gain for the female gender is 1.8 which is higher than that of the male gender which is 0.48.

Hypothesis Testing

Ho_1: there is no significant difference in the mean achievement scores of students taught geometry with laboratory practical and their counter parts taught without laboratory practical.

Ho_2: there are no significant differences between the achievement of male and female student taught geometry with Laboratory practical.

Table3: Analysis of Covariance (ANCOVA) of students' achievement scores

Source	**Sum of Mean Square**	**Df**	**Mean Square**	**F**	**Sig.**	**Dec.**
Corrected Model	96.711[a]	2	548.355	1396.595	0.000	
Group	334.124	1	224.124	318.408	0.000	S
Gender	144.293	1	144.293	131.189	0.000	S
Error	75.779	193	.393			
Corrected Total	1172.4	0	195			

Key: S = Significance

Hypothesis one has F value of 318.408 with an associated probability value of 0.00 indicated that the null hypothesis of non-significant difference is rejected. This is because the associated probability value of 0.000 is lesser than that of the alpha value of 0.005 hence there are significant difference in the mean achievement scores of the student taught geometry with laboratory practical and their counter parts taught geometry without laboratory practical in favour of experimental group.

In hypothesis two the F value of 131.189 has an associated probability value of 0.000 indicated that the null hypothesis of non-significant difference is rejected. This is because the probability value of 0.000 is lesser than the alpha value 0.05 hence there are significant difference in the mean achievement scores of male and female students taught geometry with mathematics laboratory practical in favour of female students.

Conclusion

The findings showed that laboratory practical in teaching and learning of geometry enhances students' achievement. More so, there exist gender difference in students' achievement when Mathematics Laboratory Practical is used in teaching and learning of geometry and the difference favours female students.The implication of this study is that teachers in the field should be motivated to adopt laboratory practical to make lessons more interesting for students.

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