

# EFFECTS OF GUIDED DISCOVERY TEACHING STRATEGY ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN GEOMETRY IN GWAGWALADA AREA COUNCIL, ABUJA, NIGERIA

<sup>1</sup>Onochojare, A.A., <sup>2</sup>Gimba, R.W. & <sup>3</sup>Hassan, A.A.

1) Junior Secondary School,

Bako, Kwali Area Council, Abuja, Nigeria

2) Department of Science Education,

Federal university of Technology, Minna, Niger State 3)

Department of Science Education,

Federal university of Technology, Minna, Niger State

## Abstract

*The purpose of this study was to determine the effect of Guided Discovery Teaching Strategy on senior secondary school students' achievement in Geometry in Gwagwalada Area Council, Abuja. The research design that was adopted for the study was the quasi-experimental type. A sample size of 107 SS 2 students from two co-educational senior secondary schools was used for the study. A multi-stage sampling technique was used first to select the schools. Then the classes used for the study were selected by simple random sampling using the ballot system. Mathematics Achievement Test on Geometry (MATG) adapted from past WAEC questions was the only instrument that was used for data collection. The instrument was validated by four research experts and had a reliability coefficient of 0.89 after a pilot test was conducted on the instrument. Two research questions and two null hypotheses tested at 0.05 level of significance guided the study. Mean and standard deviation were used to answer the research questions while independent t-test was used to test the hypotheses. Results from the findings showed that the students who were taught Geometry using Guided discovery teaching strategy had better achievement scores than those who were taught using the conventional method. Also, there was no significant difference in the mean achievement scores of male and female students taught Geometry using Guided discovery teaching strategy. It was recommended among others that Mathematics teachers should use Guided discovery teaching strategy in the teaching and learning of Mathematics.*

**Keywords:** Guided discovery, teaching strategy, students, achievement, geometry

## Introduction

Mathematics is one of the compulsory subjects that students offer in primary and secondary schools in Nigeria (FRN, 2013). All courses in tertiary institutions require at least a credit pass in Mathematics in order to be offered admission. It is a subject that is applicable in all fields of life and it is applied in all aspects of human endeavours. Nigerian Educational Research and Development Council (2012) divided senior secondary school Mathematics into the following areas of study: Number and numeration, Algebra, Geometry, Statistics and Introductory Calculus. Adu (2008) defined Geometry as a branch of Mathematics which deals with the study of different shapes and sizes as well as their properties. Geometry is used by many in various fields. The engineers use the knowledge of geometry to design and build houses and also to construct bridges and roads. Geometry is also important in learning other branches of Mathematics like number and numeration, algebraic process and introductory calculus. Sambo (2015) stated that geometry is an appropriate vehicle for proving the process of Mathematical logic. This is mostly applicable in circle theorems. Students or learners who are good at geometry have

potential abilities to solve many of the societal problems whether social, economic, technological and so on. This will in turn help in building a strong and united nation.

Despite the importance attached to Mathematics as documented in the National Policy of Education (FRN, 2013), Geometry has been continuously reported as one of the themes where students are still persistently having low achievement compared to other themes. West African Examinations Council Chief Examiner's report May/June (2010- 2016), reported that questions on geometry were either skipped by many candidates or were poorly attempted by candidates. It was reported that candidates could not recall and apply circle theorems correctly and the performance of students in Mathematics, particularly in geometry was poor.

Researchers like Adebayo (2010), Nwankwo (2012), and Anibueze (2017) have identified a major factor responsible for the low achievement and abysmal performance of students in Mathematics as the use of inappropriate and ineffective teaching strategies. Many Mathematics teachers are still using the conventional method to teach Mathematics in most secondary schools in Gwagwalada Area council as observed by the researcher. This method makes students to be passive in the teaching and learning process. This poor achievement and abysmal performance is not healthy for national development. Therefore, there is an urgent need to make use of teaching strategies that learners will be adequately involved in the teaching and learning process in order to reverse this ugly trend. In another vein, Julie (2015) said that all is not well with the teaching and learning of Mathematics and Geometry in particular. She further stated that teachers-students Mathematical thinking and the learner centered is the most appropriate approach in Geometry instruction.

There are other teaching strategies such as guided discovery, mastery learning strategy, simulation strategy, project-based strategy which the researcher felt could be more effective in teaching and learning of Mathematics compare to the conventional method of teaching. An experience teacher should be able to decide the teaching strategy that will match the level of learners in order to improve on the achievement of learners in Mathematics, like the use of Guided discovery teaching strategy. Ozomadu (2016) carried out a study on the effectiveness of Guided discovery method in teaching Algebra in Enugu. The result showed that Guided discovery yielded a better result compared to expository method. Guided discovery teaching strategy is a learner-centred approach to teaching and learning of Mathematics with learners centred activities to actively involve the learners. It is an aid to problem solving. In Guided discovery method, the teacher explains exactly what the learners should do, gives them a free-hand to carry out the activities, but gives suitable guides to prevent learners from going astray. In guiding the students, the teacher uses instructional materials and asks the learners probing questions that will enable the learners to discover answers to the problem. According to Ekhasemomhe (2010) guided discovery teaching strategy has the capacity to promote critical thinking among students thereby leading to achievement of desired objectives. This critical thinking capacity is needed in circle theorems geometry.

Tenty and Awe (2011) defined academic achievement as the gain in knowledge by students as a result of participating in teaching and learning activities. In this study, the emphasis is on the teaching and learning of circle geometry.

In this study, gender is used as a moderating variable because it is important to find out if the treatment is sensitive to gender since it is linked to achievement. It has to do with personality and central components of self-concept. Jacob and Linus (2017) defined gender as a range of physical, biological, mental and behavioral characteristics pertaining to masculinity and femininity and which also differentiate between masculinity and femininity.

Researchers have different view on the influence of gender on students' achievement as gender issues have long been a topic of educational research, particularly in the area of Mathematics which has generated a lot of conflicting and inconclusive results among educationalists and researchers. Results of some studies showed significant differences in the achievement of female and male students in

Mathematics, others show contrary results. For example, researchers such as (Asante 2010; Popoola and Ajani 2011; Oloda 2017) reported that male students performed better than the female students in Mathematics Achievement Test. Others researchers such as (Olasehinde and Ololaye, 2014) said that there was no significant difference in the achievement of students based on gender. This claim was equally supported by Ajai and Imoke (2015) who revealed that male and female students performed equally in Mathematics whereas, Unodiaku (2015) and Anibueze (2017) in their separate study reported that female performed better than the male students. This conflicting results call for continuous investigation especially with teaching strategy like Guided discovery strategy to bring equity in gender achievement in mathematics. It is on this note that the researchers carried out a study on the effect of Guided discovery teaching strategy on senior school students' achievement in geometry in Gwagwalada Area Council, Abuja.

### **STATEMENT OF THE PROBLEM**

The teaching and learning of Mathematics is currently in a challenging state due to the constant poor achievement of students in external examination. Over the years, researchers (Nizoloman, 2013; Telina, 2016; Isa, 2017) have observed poor performance of students in Mathematics. The WAEC chief examiner's report of 2010-2017 also indicated that the performance of students in Mathematics is still poor. This poor performance is noticeable in mostly geometry. They reported that candidates either completely avoided questions on geometry or performed poorly in geometry most especially in circle theorems.

This issue of Students' poor achievement in Mathematics, particularly in geometry has created a concern for the researcher to look into possible solution to the problem identified.

Researchers like Nwankwo (2012), and Anibueze (2017) have stated that lack of appropriate teaching methodology (pedagogy) as a major factor responsible for students' poor achievement in Mathematics. Other factors could be laziness on the part of the students, congested classroom, teachers not using instructional materials during teaching amongst others as observed by the researcher. Many methods of teaching are suggested for improving achievement of students in Mathematics at the secondary school level. Among the teaching strategies that have been recommended to be effective in teaching of Mathematics by Akanmu and Fajemidagba (2013) and Ozomadu (2016) is Guided discovery teaching strategy. It is on this basis that the researchers carried out a study on the effects of Guided discovery teaching strategy on senior secondary school students' achievement in geometry in Gwagwalada Area council, Abuja to see if students' achievement would be improved upon using this teaching strategy.

### **OBJECTIVES OF THE STUDY**

1. Determine the effect of guided discovery teaching strategy on senior secondary school students' achievement in geometry in Gwagwalada Area Council, Abuja.
2. Find out the mean achievement scores of male and female senior secondary students taught Mathematics using Guided discovery teaching strategy.

### **RESEARCH QUESTIONS**

The following research questions were raised to guide the study

1. What is the difference in the mean achievement scores of students taught Geometry using Guided discovery teaching strategy and those taught using conventional method?
2. What is the difference in the mean achievement scores of male and female students taught Geometry using Guided discovery teaching strategy?

**RESEARCH HYPOTHESES**

Ho<sub>1</sub>: There is no significant difference in the mean achievement scores of students taught Geometry using guided discovery teaching strategies compared to those taught geometry using conventional teaching method.

Ho<sub>2</sub>: There is no significant difference in the mean achievement scores of male and female students taught Geometry using Guided discovery teaching strategy.

**METHODOLOGY**

The research design that was adopted for this study was the quasi-experimental design. A pretest- posttest control and experimental group design was used for the study. The area covered in this study was Gwagwalada Area Council, Abuja. A sample size for the study was 107 SS II Mathematics students (46 males and 61 females). This sample size was obtained from two intact classes randomly selected from two public senior secondary schools two (SS 2) students in the scope of study. The research instrument that was used for the study was the Mathematics Achievement Test on Geometry (MATG) adapted from past West African Examinations Council (WAEC) Mathematics past questions. The content areas tested on were: circle theorems and their applications. The test instrument constructed consisted of 25 multiple choice objective questions consisting of four options (A-D). MATG was validated by four Experts in Mathematics Education

The Reliability of MATG was determined using test- retest method. The test instrument was administered to SS 2 students in a non-participating school. SPSS version 23 was used to correlate the scores obtained from the pilot –study carried out. A reliability coefficient of 0.89 was obtained using Pearson Product Moment Correlation Coefficient.

The study lasted for a period of four (4) weeks. The researchers used the first week of the study for training of Mathematics teachers who served as research assistants for the study as well as administration of the pre-test to the two groups of students. The second and the third week were used for the actual study. After the study, the reshuffled MATG was re-administered to the students. The scripts were collected immediately from the students for marking. The data obtained was subjected to data analysis using mean, standard deviation and t-test.

**RESULTS Research Question one**

What is the difference in the mean achievement scores of students taught Geometry using Guided discovery teaching strategy and those taught using conventional method?

**Table 1** Mean and standard deviation of Experimental and control groups

Group	N	Mean	Std. Deviation
Experimental Group	58	16.98	2.290
Control Group	49	12.53	3.453

The result in table 1 above shows the mean achievement scores and standard deviation of the experimental group as 16.98 and 2.290 respectively, while that of the control group as 12.53 and 3.453 respectively. This result revealed that the experimental group achieved more than the control group.

**Research Question two**

What is the difference in the mean achievement scores of male and female students taught Geometry using Guided discovery teaching strategy?

**Table 2:** Mean and standard deviation of male and female students in the experimental group

Gender	N	Mean	Std. Deviation
Male students	22	17.32	2.852
Female students	36	16.78	1.884

The result in table 2 shows the mean achievement scores and standard deviation of male students as 17.32 and 2.852 respectively, while that of the female students as 16.78 and 1.884 respectively. The result indicates minimal difference in their mean achievement scores in favour of male students.

Ho<sub>1</sub>: There is no significant difference in the mean achievement scores of students taught Geometry using guided discovery teaching strategies compared to those taught geometry using conventional teaching method.

**Table 3**Summary of independent t-test for experimental and control groups<sup>†</sup>Significant at P<0.05

Group	N	df	Mean	Std. Deviation	T	P
Experimental Group	58	105	16.98	2.290	7.966	0.000
Control Group	49		12.53	3.453		

Table 3 shows the t-test comparison of the mean achievement scores of the experimental and control groups. The table revealed that there was a significant difference between the experimental and the control group since p is less than 0.05 level of significant. The significant difference is in favour of the experimental group implying that the students taught with guided discovery teaching strategy achieved better than those taught with the conventional method.

Ho<sub>2</sub>: There is no significant difference in the mean achievement scores of male and female students taught Geometry using Guided discovery teaching strategy

**Table 4:**Summary of independent t-test for male and female students for experimental group

Gender	N	df	Mean	Std. Deviation	T	P
Male	22	56	17.32	2.85	0.87	0.36
Female	36		16.78	1.88		

<sup>†</sup>Significant at P<0.05

From the table above, p-value (0.36) > 0.05, therefore, the hypothesis is accepted which means there is no significant difference between the mean achievement scores of male and female students taught Geometry using Guided discovery teaching strategy.

**DISCUSSION**

The main objective of this study was to determine the effect of Guided discovery teaching strategy on senior secondary school students’ achievement in Geometry and the findings from the t-test of the achievement mean scores showed that students that were given treatment achieved better than the other group. The findings of this study agrees with that of Ozomadu (2016) who carried out a similar study in Enugu and found that Guided discovery strategy was more effective than the conventional method on students’ acquisition of knowledge in teaching-learning process. The study also indicated that both male and female students benefitted equally from the Guided discovery teaching strategy. This findings is

similar to that of Ololaye(2014) and also that of Ajai and Imoke(2015) that gender had no effect on academic achievement of students in Mathematics.

### CONCLUSION

Guided discovery teaching strategy produced a better result than the conventional method of teaching Mathematics because it enhances students' academic achievement in Geometry (a major branch of Mathematics) going by the result of this study.

### RECOMMENDATIONS

The following recommendations are made based on the findings from this study:

1. Guided discovery teaching strategy should be used in teaching and learning of Mathematics since this method has proved to be effective in enhancing students' academic achievement in Geometry.
2. Mathematics teachers should be patient in using this strategy to obtain a better result since it is time consuming.
3. Every students in respective of gender should be given equal opportunity in Mathematics class since male are not superior to female as found out in this study.
4. Government should organise regular workshop and training for Mathematics teachers so as to get general orientation on the utilization of Guided discovery teaching strategy.

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