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Attitude of Mathematics Teachers Towards the Use of Activity Based and Guided Discovery Strategies in Improving Students Understanding of Geometric Concepts

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Abstract

The study aims to examine attitude of mathematics teachers towards the use of Activity Based teaching strategy and Guided discovery teaching strategy in improving students' understanding of Geometric concepts. The study used survey design with half of the students (50) were subjected to Activity based teaching strategy and the remaining half were subjected to guided discovery teaching strategy (50) making a sample size of 100 students for the research study. A total of 26 mathematics teachers were used for the study, where 13 teachers were those who employed guided discovery teaching strategy and the remaining 13 were subjected to answer questions based on their attitude towards using activity-based teaching strategy to improve students understanding of geometric concepts known as Mathematics Teachers Attitude Test (MTAT). The attitudinal scale was determine using Likert 4 point scale for SA (strongly Agree), A (Agree), D (Disagree) and SD (Strongly Disagree) respectively. However, the 100 students were split into two groups and questions in selected areas of geometry were formulated by the researchers also known as Students Geometric Achievement Test (SGAT). The researchers

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used simple random sampling to select the 100 students based on the use of guided discovery teaching strategy and activity based teaching strategy in Zing LGA, Taraba State, Nigeria by their Mathematics Teachers. The method used for data analysis is mean scores, standard deviation and t-test distribution. Results of the study revealed that mathematics teachers of the study area have interest in the use of Activity based teaching strategy and Guided discovery teaching strategy to improve students understanding of geometric concepts. Teachers believe in this study that students do not feel boring when guided discovery teaching strategy is used in teaching geometric concepts to them. At 5% level of significance it was revealed further that, there is no significant difference in the Attitude of mathematics teachers on the use of Activity based teaching and guided discovery teaching strategies to improve students understanding of geometric concepts. It was recommended in this study that teachers should endeavor to employ the two selected teaching strategies in other to improve students understanding of geometric concepts in Zing local government Area.

Keywords: Attitude, Geometric Concepts, Students Understanding, Teaching Strategy, Activity Based & Guided Discovery

INTRODUCTION

In recent time, the method used in teaching mathematics has been shifted from conventional teaching and learning to more distinct and enjoyable methods. However, many teachers are yet to improve on the teaching of mathematics among secondary schools in Nigeria. Considering the contributions of Ayinla (2011) who explained that Mathematics is the pillar of all knowledge showing its relevance to all discipline. Generally, The World today is nobly regarded as a global village, characterized by major advancement in computer and information technology. This age has brought lots of sophistication in mathematics, in order to be able to sustain the developments in the subject area various teaching methods need to be incorporated. As such, different teaching methods has been identified in other to improve teaching and arouse students' engagement as well their understanding of the concepts. Among the selected areas of Mathematics is geometry. The teaching and learning of geometry has been the subject of considerable international interest, with many questions remaining about appropriate teaching methods and curriculum design, with a view to informing the development of better pedagogical models and instructional strategies in teaching geometry. Geometry conception has been

considered as a base for learning mathematics. Nevertheless geometry as a branch of mathematics is perceived as difficult by most of the students.

Pathetically, it is strongly believed that mastery and utilization of modern science and technology that basically distinguishes the so-called developing nations from the developed ones of the world are in fact, the level of constructive and critical ideas they have put in place productively to create new innovations. As such, Mathematics is that field of study that can produced such constructive and idealistic learners around the world. In the bases of it important contributions, the present study chose to focus on geometry as a branch of mathematics that deals with spatial relationships, individual objects, and the properties of surrounding space. Adolphus (2011) in his contribution inscribes "geometry is the most difficult topics by many students." However, the difficulty Fonna and Mursalin, (2019) believe is caused by heavy use of formulas and questions, and students are less trained with the creativity and understanding of geometry concepts which in returns, made mathematics learning more complicated. Other factors to consider is Mathematics teachers attitude in the used of inconvenient teaching method. Mathematics teachers are those who embedded (solidly) mathematical skills, functionary abilities and critical thinking minds on their learners. That is why Eze (2011) noted, Students' inability to accurately observe objects, measure, relate, manipulate, draw and even re-arrange objects form reasons for poor academic performance in geometry.

In recent time, researchers like Damayanti, Krisdiana, and Setyansah, (2019); Rohendi, Septian and Sutarno, (2018) in their findings as cited in Siregar, Roslinda and Siti (2019) proclaimed that in overcoming the problems faced by students, teachers need to realize learning methods that provide broadest opportunities for students to be actively involved in the Teaching & Learning process, especially on Geometry topics.

Specifically, using discovery teaching methods and Activity based teaching Method are usually most of those methods that teachers needs to possessed a positive attitude towards using it in other to improve students understanding of Mathematics. Even Siregar, Roslinda and Siti (2019) addresses in their contributions that the discovery method on the topic of Geometry in mathematics learning in schools is very encouraged to be applied for high school students. This method of teaching, students acquire scientific knowledge and skills based on constructivism learning theory. Slavin (2018) achievably view also that students need to understand and be able to apply their knowledge, solve problems, find

something by themselves. In the other hand, Activity-Based teaching enables students to handle concrete materials which reduce the abstract nature of the concept learned. This makes learning more meaningful and when concepts are meaningfully learned, it enhances retention and heightens student's performance and achievement. As a matter of fact, teachers of mathematics own poor idea and attitude towards teaching geometrical concepts. Most of them are those who were enrolled in teaching as a result of one reasons or the other which is not their passionate profession. However, for any innovation to work in education, attitude of the custodian of knowledge is very requisite. Attitude is defined as a complex mental state involving beliefs and feelings.

Researchers like Sutman, Schmuckler and Woodfield, (2010) believe that the discovery learning process involved the development of many skills in the form of critical skills, observation, reasoning, measurement, manipulation of numerical data, preparation of schedules, graphs, and data interpretation. Also, Bahadır and Özdemir (2013) purports in their findings that Activity based teaching strategy is needed to save children from boring classroom environment and the limits of thinking in solid patterns, and take them to a multi-dimensional world, where processes such as imagination, perception and emotion are intertwined.

In light of the above contributions, the researchers in this study tend to examine attitude of mathematics teachers towards the use of activity based teaching strategy and guided discovery strategy in improving students understanding of geometrical concepts.

Statement of the Problem

The effectiveness of teaching and learning solely rely on teachers' ability to render a well conducive environment for the students through providing appropriate and constructive instructions as well as a strategic methods to achieve goals of the topic in our schools. However, the mathematics teachers instead, are those who show nonchalant attitudes towards teaching some mathematical concepts where students record poor achievement. Revealing the unsatisfactory records, Adegun and Adegun, (2013) stated that students generally encountered difficulties in geometry and performed poorly in senior secondary school mathematics lesson. Even Telima (2011) also found out that many students fail to grasp key concepts in geometry and leave mathematics classes without learning the basic terminology. Other factors contributing to students' poor achievement and understanding of geometry are non-availability and obsolescence of instructional materials, gender

differences, poor reasoning skill, inadequate time, inadequate school curriculum and lack of proof by students. However, all these are believed to have a negative effect on the learning of geometry.

The main teaching method being adopted by many mathematics teachers in Nigeria is the lecture or conventional method which has great impact on students' achievement. In this regard, geometry as a branch of mathematics is stunted among students in secondary schools due to teachers' attitude in used of inappropriate teaching method. In line with the befalling challenges facing teaching and learning in our schools, the researchers attempted to find out answers to the following question: what attitude of geometrical concepts do mathematics teachers possessed that influences their students' understanding of mathematics based on the use of activity based and guided discovery teaching strategies among secondary school students? In searched to attempt this question, the researchers investigated the attitude of mathematics teachers towards the used of Activity based teaching strategy and guided discovery teaching strategy to improve student's understanding of geometric concepts.

Purpose of the Study

The study will attempt to find out Attitude of Mathematics Teachers' towards the use of activity based teaching strategy and guided discovery strategy in improving students understanding of geometric concepts. The specific objectives of this study are:

i. To assess Mathematics teachers Attitude on the use of Activity based Teaching Strategy to improve students understanding of geometric Concepts.
ii. To assess Mathematics teachers Attitude on the use of Guided discovery Teaching Strategy to improve students understanding of geometric Concepts.
iii. To compare students understanding of geometric concepts using Activity based teaching strategy and Guided discovery teaching strategy.

Research Questions

The following Questions are formulated to guide the research study:

i. What are the Attitudes of Mathematics teachers on the use of Activity based teaching strategy to improve students understanding of geometric concepts?
ii. What are the Attitude of Mathematics teachers on the use of guided discovery teaching strategy to improve students understanding of geometric concepts?

iii. What is the differences in geometrical concepts understanding of students taught using Activity based teaching strategy and Guided discovery teaching strategy?

Research Hypotheses

Based on the objectives of this study, two hypotheses were tested:

H_{01}: There is no significant Difference in the Attitude of Mathematics Teachers on the use of Activity based teaching and guided discovery teaching strategies to improve students understanding of geometric concepts.

H_{02}: There is no significant Difference in geometric concepts understanding of students taught using Activity based teaching strategy and Guided Discovery teaching strategy.

Basic Assumptions

For the sake of this study, the researchers used method and strategy interchangeably. It means that strategy is also regarded as methods in this present study.

MATERIALS AND METHODS

The design that was adopted for this study is a Survey design. It is useful in describing the characteristics of a large population. The population of this study was made up of the senior secondary II (SS II) students in Zing LGA of Taraba State, Nigeria. There are 28 secondary schools with a total population of 5565 senior secondary schools students in Zing LGA. The sample for this study is 100 students and 26 mathematics teachers where 43 of the 100 students were female and 57 were male students. Also, 08 of the 26 teachers were female and 18 were male students. Split into two equal groups. A simple random sampling was used to select respondents used in this present study. The instrument used for data collection is the Mathematics Teachers Attitude Test (MTAT) where teachers are subjected to questions based on their perception on the use of Activity based teaching strategy and guided discovery teaching strategy to improve students understanding of geometrical concepts among selected schools in Zing Local Government Area of Taraba State. A Four point Likert scale was used for the Research study to determine teachers' attitudes. In the other hand, Students understanding of geometrical concepts on the use of activity based teaching and guided discovery teaching method were compared using

Students Geometric Achievement Test (SGAT) using the selected 100 students both male and female students were considered for the research study. Furthermore, the method used for administering the instrument was done immediately after the selected teachers' subject their students to guided discovery teaching method and activity based teaching method. More so, the 100 selected students from the schools in Zing LGA, Taraba State were split into two groups, 50 were taught using guided discovery teaching strategy by 13 teachers in different schools of the location selected at random and the remaining 50 students were subjected to Activity based teaching strategy also taught by 13 teachers. The researchers used mean scores, standard deviation and t-test distribution for the analysis of data.

RESULTS

Data analysis, presentation and interpretation were addressed according to research questions and hypotheses.

Research Questions 1

What are the Attitudes of Mathematics teachers on the use of Activity based teaching strategy to improve students understanding of geometric concepts?

Table 1: Attitude of Mathematics Teachers towards the use of Activity Based teaching Strategy

S/N	ITEMS	SA	A	D	SD	$\bar{x}$	δ	Decision Rule
1	I have interest in teaching geometric concepts to secondary school students	02	03	08	00	2.54	0.7458	Accepted
2	I always use Activity Based teaching method while teaching students	10	02	00	01	3.62	0.8356	Accepted
3	Students Enjoy my class whenever I use Activity Based teaching method	03	06	03	01	2.85	0.8635	Accepted
4	Using Activity based teaching method can improve teaching and learning geometric concepts in secondary school schools	08	05	00	00	3.08	0.7234	Accepted
5	Do you treat boys differently from girls in used of Activity based learning in your area?	01	00	02	10	1.38	0.8356	Rejected
6	My students feel boring when I used activity based teaching method	07	02	03	01	3.15	1.0263	Accepted
7	Students solve problems and apply their knowledge to get solutions	03	04	01	05	2.38	1.2114	Rejected

Results in table 1 revealed that all items in S/NO 1 were accepted except S/NO 5 and 7 were rejected that they do not treat boys differently from girls in the used of Activity based teaching Strategy and also the teachers responded that their students do not solve problem and apply their knowledge to get solutions among secondary schools in Zing Local Government Area of Taraba State, Nigeria.

Research Question II

What are the Attitude of Mathematics teachers on the use of guided discovery teaching strategy to improve students understanding of geometric concepts?

Table 2: Attitude of Mathematics Teachers towards the use of Guided Discovery Teaching Strategy

S/N	ITEMS	SA	A	D	SD	$\bar{x}$	δ	Decision Rule
1	I have interest in teaching geometric concepts to secondary school students	06	04	01	02	3.08	1.0714	Rejected
2	I always use guided discovery teaching method while teaching students.	02	06	02	03	2.54	1.0088	Accepted
3	Students Enjoy my class whenever I use guided discovery teaching method	03	06	03	01	2.85	0.8635	Accepted
4	Using guided discovery teaching method can improve teaching and learning geometric concepts in secondary school schools	03	04	01	05	2.38	1.2114	Rejected
5	Do you treat boys differently from girls in used of guided discovery teaching strategy in your area?	01	00	02	10	1.38	0.8356	Rejected
6	My students do not feel boring when I used guided discovery teaching method.	07	02	03	01	3.15	1.0263	Accepted
7	Students solve problems and apply their knowledge to get solutions	00	02	03	08	1.54	0.7458	Rejected
8	Students develop many skills in form of critical skills, observation, reasoning and manipulation of numerical data.	10	02	00	01	3.62	0.8356	Accepted

Results from table 2 indicates that items in S/NO 1, 4, 5 and 7 were rejected while items in S/NO 2, 3, 6 and 8 were accepted at the criterion point of 2.50 points respectively.

Research Question III

What is the differences in geometrical concepts understanding of students taught using Activity based teaching strategy and guided discovery teaching strategy?

Table 3: Geometric achievement of Student taught Using Activity Based Strategy and guided discovery Teaching strategy in Zing LGA, Taraba State

Teaching Method	N	$\bar{x}$	SD	Mean Difference
Activity Based Teaching Strategy	50	13.28	4.3956	**2.00**
Guided Discovery Teaching Strategy	50	11.28	4.6906	

Results from table 3 indicates that students taught geometric concept using Activity based teaching strategy have better Achievement than students who were taught geometric concepts using guided discovery teaching strategy out of the selected students in Zing Local Government Area, Taraba State. However, it is believe that students understanding of geometric concepts is better improve using activity based teaching strategy than guided discovery teaching strategy as analysis shown 13.28 and 11.28 mean scores respectively.

Research Hypothesis 1

Table 4: T-test Distribution of Mean Responses of Mathematics Teachers Attitude on the use of Activity Based teaching Strategy and Guided discovery teaching Strategy in Zing LGA

Teaching Method	N	$\bar{X}$	SD	Df	t-cal	t-crit.	Remarks
Guided discovery teaching Method	13	20.54	07.5984	24	0.5647	2.064	* *
Activity based teaching Method	13	19.00	06.2416				

From the above Analysis, it was shown that $T_{cal} < T_{crit.}$. It means that the null hypothesis is accepted that there is no significant Difference in the Attitude of Mathematics Teachers on the use of Activity based teaching and guided discovery teaching strategies to improve students understanding of geometric concepts.

Research Hypothesis II

Table 5: T-test distribution of Geometric achievement of Student taught Using Activity Based Strategy and guided discovery teaching strategy in Zing LGA, Taraba State

Students Achievement	N	$\bar{X}$	SD	Df	t-cal	t-crit.	Remarks
Students A	50	13.28	04.3956				
				98	1.1218	1.987	* *
Students G	50	11.28	04.6906				

- Students A = Students taught using Activity based teaching Strategy
- Students G = Students taught using Guided discovery teaching Strategy

Results from table 5 indicates that t-calculated value is less than the t-critical, as such, we accepted the null hypothesis that there is no significant Difference in geometric concepts understanding of students taught using Activity based teaching strategy and Guided Discovery teaching strategy.

DISCUSSION

Generally, study in this research study revealed that selected mathematics teachers of the study area have interest in the use of Activity based teaching strategy and Guided discovery teaching strategy in Zing local government Area, Taraba State. The teachers responded that students feel boring when teachers used activity based teaching strategy. The study rejected findings by Bahadır and Ozdemir (2013) who purports in their findings that Activity based teaching strategy is needed to save children from boring classroom environment and the limits of thinking in solid patterns, and take them to a multi-dimensional world, where processes such as imagination, perception and emotion are intertwined. Again, teachers believe that students do not feel boring when guided discovery teaching strategy is used in teaching geometric concepts. Also, it was responded by teachers in the study area that Students develop many skills in form of critical skills, observation, reasoning and manipulation of numerical data when taught using guided discovery teaching method in Zing LGA, Taraba State. The findings is in connection with Sutman, Schmuckler and Woodfield, (2010) who hinted in there research that the discovery learning process involved the development of many skills in the form of critical skills, observation,

reasoning, measurement, manipulation of numerical data, preparation of schedules, graphs, and data interpretation. Two test of hypotheses from the findings revealed that there is no significant Difference in geometric concepts understanding of students taught using Activity based teaching strategy and Guided Discovery teaching strategy. However, it is believe that the incorporation of both two teaching methods can improving students understanding of geometric concepts is relatively in line with the idea of Siregar, Roslinda and Siti (2019) who submitted that in overcoming the problems faced by students, teachers need to realize learning methods that provide broadest opportunities for students to be actively involved in the Teaching & Learning process, especially on Geometry topics. Since selected teachers in the study area from the test of hypothesis believe that there is no significant Difference in the Attitude of Mathematics Teachers on the use of Activity based teaching and guided discovery teaching strategies to improve students understanding of geometric concepts.

CONCLUSION

It is concluded in this study that the used of Activity Based teaching strategy and guided Discovery teaching strategy can improve students understanding of geometric concepts when both methods are incorporated by teachers in the classroom environment. As study from responses of Mathematics teachers revealed that students feel boring when Activity based strategy is used but they do not feel boring when guided discovery teaching strategy is used to improve students understanding of geometric concepts in the selected schools in Zing Local Government Area.

Recommendations

Based on the objectives in this study, the following are the recommendations made by the researchers:

i. Teachers should allow students to solve problems and apply their knowledge in other to hinder boring teaching –learning classroom environment in Zing Local Government Area. As such, their weaknesses can be corrected and thus, arouse their interest.

ii. Teachers should encourage the use of guided discovery teaching strategy in their class in other to improve the understanding of students towards geometrical concepts in Zing Local Government Area, Taraba State.

iii. Teachers should endeavor to employ the two selected teaching strategies in other to improve students understanding of geometric concepts in Zing local government Area.

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