Problems of Teaching and Learning of Geometry in Secondary Schools in Rivers State, Nigeria

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Abstract. It has been observed that students shy away from the study of mathematics even though it is the bed rock of science and technology. This shows the negative attitude and poor performance of students in mathematics. It is this backdrop that prompted the research into the problem of teaching and learning of geometry in secondary schools. The study is aimed at identifying the problems and proffering solution to them. Consequently, two research questions were raised. (1) What factors are responsible for the difficulty in the teaching and learning of geometry in secondary schools? (2) What strategies could be adopted to enhance better teaching and learning of geometry in secondary schools? Some factors were investigated which revolve around physical facilities, quality and quantity of teaching staff, attitude of students, parents and government Data were collected by means of two different questionnaires administered to three hundred (300) students and thirty (30) teachers drawn from ten (10) secondary schools in Rivers State. The four points Likert rating scale was used in administering it and it was analyzed using simple mean. Some of the findings that emerged are: (1) the foundation of most mathematics teachers in geometry is poor. (2) The students have poor foundation in mathematics. (3) The teaching and learning environment is not conducive. Based on the findings, it was recommended that (a) The State government should as a matter of urgency send mathematics teachers for training and seminars for effective teaching and learning. (b) The government should endeavor to provide the necessary infrastructures and facilities that will motivate teaching and learning of mathematics.

Keywords: Geometry, Teaching, Learning, Performance

1. INTRODUCTION

The place of Mathematics in the life of any nation cannot be overemphasized because it is linked with the place of development in that nation. According to Betiku [1] science, Technology and Mathematics Education (STME) has been widely acclaimed to be the index of measuring any nation's socio economic and geo-political development. Among science and Technology courses, according to the National Policy on Education [2], Mathematics is one of the core subjects to be offered by all students till the tertiary levels of education. This compulsory nature of

mathematics carries with it the assumption that the knowledge of the subject is essential for all members of our society. Mathematics competence is a critical determinant of the Post-Secondary educational and career options available to young people [3]. Also, Barrow and Woods [4] emphasized the need to make mathematics a compulsory subject at the primary and secondary levels if scientists, technologists and engineers are to be produced. In our Universities, the teaching and learning of Mathematics should be taken very serious. The quality of mathematics that will pave way for the much needed pursuit in science and technology at the higher level is a matter of concern. Quality has to do with the attainment of standards and standards ensure accountability. Obodo [5], lamented the poor state of mathematics instruction in Nigeria and averred that the problem of quality of mathematics instruction and learning are from diverse sources. The teacher has been accused to be responsible for the low quality of student performance in our secondary schools [6].

Despite the relative importance of mathematics, it is very disappointing to note that the student's performance in the subject in both internal and external examinations has remained consistently poor. [7, 8]

Mathematics educators have put up noble and spirited efforts aimed at identifying the major problems associated with the teaching and learning of mathematics in the nation's schools. Despite all these noble efforts, the problem of poor achievement in mathematics has continued to rear its head in the nation's public examinations.

This research examines the core topics in geometry where the problems of teaching and learning occurs most in mathematics. Topics such as plane and solid shapes, measurement of plans and solid shapes, polygons, Geometrical ratio, geometrical transformation, latitude and longitude etc are topics that are generally identified to be difficult by both students and teachers.

Geometry is an aspect of mathematics which deals with the study of different shapes. These shapes may be plane or solid. A plane shape is a geometrical form such that the straight line that joins any two points on it wholly lies on the surface. A solid shape on the other hand is bounded by surfaces which may not wholly be represented on a plane surface.

Statistics have shown difficulty in teaching and learning of mathematics, geometry in particular, has resulted in mass failure in examinations. The mass failure in mathematics examinations is real and the trend of student's performance has been on the decline [9,10,7].

A cluster of variables has been implicated as responsible for the dismal performance of students. These include, government related variables, curriculum-rebated variables, examination body related, teacher, student, home and text-book related variables. A part from these variables, Amazigbo [8] has identified poor primary school background in mathematics, lack of incentives for teachers, unqualified teachers in the system, lack of learner's interest, perception that mathematics is difficult, large classes and psychological fear of the subject as factors responsible for the dismal performance of students in the subject.

Osafemnti [11] contends that curriculum changes in mathematics have occurred in several countries for one reason or the other, but more importantly because of the

desire to improve school mathematics teaching to meet the ever changing needs of society, science and technology. In Nigeria, curriculum changes have occurred and for a long time, the tendency has been to transfer unquestionably, syllabus from the advanced countries based on the universality of the Subject. Such undertakings, looses sight of some problems usually raised by curriculum change. Osafemnti [11] outlined the following problems with curriculum changes in Nigeria.

1. Failure of the mathematics to relate to the child's environment and thus the child cannot see the importance and immediate application of mathematics, in particular geometry in his day to day living.
2. Each new curriculum has always taken the teachers unawares because they had never been involved in the development of the curriculum.
3. The Nigerian Educational system has been constituted in such a way that teachers training, curriculum development and classroom practice are three separate activities. Therefore, curriculum changes have taken place without due consideration for the training of teachers who will use them both at the pre-service and in-service operational and training levels.
4. Non-availability of instructional materials such as text books, workbooks, slides, film stripes, etc. to meet the pedagogical demands of the new curriculum imposed on teachers.

For a topic like geometry which is the bedrock of engineering and technological development, the issue of adequate physical facilities cannot be over emphasized. The physical facilities such models will help grasp the idea of geometry which seems to be abstract. It is the facilities in terms of infrastructure, equipment and materials that afford the students the opportunity to acquire the necessary knowledge. As Solarin [12] observed on a general note, that secondary schools lack facilities and equipment for teaching. According to him, such a situation where teachers are forced to discuss theoretically, practical aspects of the subject is not good enough.

2.   STATEMENT OF THE PROBLEM

The poor performance of students in mathematics and geometry in particular has been a thing of concern to mathematics educators, parents and government. The chief examiner's annual reports in mathematics in the Senior School Certificate Examinations (SSCE) conducted by the West African Examinations Council (WAEC) and National Examinations Council (NECO) are good testimonies of those facts. Mathematics educators have put in effort aimed at identifying the major problems associated with secondary school mathematics. Despite all these noble efforts, the problem of poor achievement in mathematics has continued to rear its head. It is based on this fact that this research identified geometry as a core difficult area where student's performance has always been low.

3.   PURPOSE OF STUDY

This study is aimed at:
1. Identifying the factors that contribute to the difficulty in   teaching and learning of geometry
2. Examining the strategies that could remedy the difficulty in the teaching and learning of geometry.

4.   RESEARCH QUESTIONS

1. What factors are responsible for the difficulty in the teaching and learning of geometry in secondary schools?
2. What strategies could be adapted to enhance better teaching and learning of geometry in secondary schools?

5.   RESEARCH METHODOLOGY

The research adopted the descriptive survey method. Data were collected through questionnaires to establish the views of students and teachers on the problems of teaching and learning geometry in secondary school. The Questionnaire instrument used for the research has a reliability score of 0.853 using the test-retest method. This shows a high reliability. 300 students and thirty (30) teachers from ten secondary schools scattered all over Port Harcourt, the capital city of Rivers State were randomly selected for the study. The modified four point likert-type rating scale was adopted for the questionnaire responses were of the types strongly Agreed, Agree, Disagreed and strongly disagreed. Simple means and percentages were used to analyze the data.

6.   RESULTS AND DISCUSSION

6.1   Research Question 1

What factors are responsible for the difficulty in the teaching and learning of geometry in secondary schools?

Responses to the first ten items in the teachers and students questionnaire were used to answer the above research question. The responses were computed using mean to evaluate them. The four point Likert scale was used. The mean value for acceptance is $X \geq 2.5$ otherwise reject.

Table 1. Teachers' opinion on factors responsible for the difficulty in the teaching and learning of geometry in secondary schools in Rivers State.

S/N	Items	Responses				Mean Response
		SA	A	D	SD	
1.	The poor foundation of students in primary school mathematics poses problem in learning geometry.	18	10	2	-	3.53
2.	Students are no longer interested in hard work	10	13	7	-	3.1
3.	Students psychological fear of the topic geometry poses a problem in learning.	6	18	6	-	3.00
4.	Lack of instructional aids makes teaching and learning of geometry difficult.	12	13	5	-	3.23
5.	There are inadequate mathematics teachers in terms of number and quality.	8	17	4	1	3.07
6.	Students have problems in solving problems even when similar examples are given	2	19	7	2	2.70
7.	There are no incentives to motivate the teachers to put in their best	13	12	5	-	3.27
8.	Most mathematics teachers do not teach geometry well because of their poor foundation in geometry	4	20	4	2	2.87
9.	Large classes makes it difficult to practicalize geometry	8	15	6	1	3.00
10.	Mathematics teachers do not prepare adequately before going to class due to much work load	1	8	19	2	2.27

Table 2. Students' opinion on the factors responsible for the problem of teaching and learning geometry in secondary schools in Rivers State.

S/N	Items	Responses				Mean Response
		SA	A	D	SD	
1.	The poor foundation of students in primary school mathematics poses problem in learning geometry.	133	120	30	13	3.26

2.	The students lack interested while learning	50	135	80	29	2.70
3.	Lack of hard work on the part of students results in difficulty in understanding geometry	142	102	38	13	3.26
4.	Students have a psychological fear of the topic geometry which poses a problem in learning	78	143	60	13	2.97
5.	Lack of instruction aids makes teaching and learning of geometry difficult.	128	121	35	12	3.23
6.	Parents cannot afford to buy text books for their children	40	92	111	54	2.39
7.	There are inadequate mathematics teachers in terms of number and quality	70	114	69	42	2.72
8.	Students have problems even when similar examples are give	67	132	71	24	2.82
9.	Students do not solve geometry problems at home because nobody to guide them	64	116	78	38	2.70
10.	Students do not have mathematical instrument for drawing, this makes learning of geometry difficulty	92	121	53	27	2.95

The table above reveals that the factors listed (except) item 6, are responsible for the problem of teaching and learning geometry in secondary schools in Rivers State, it shows that students response to the items in the questionnaire were more on agreed column than strongly agreed.

It is of importance to note that the teachers and students agree strongly to the fact that the poor foundation of students, lack of hard work on the part of the students and lack of instructional aids are the major problems of teaching and learning of geometry as revealed in the table.

6. 2 Research Question 2

What strategies could be adopted to enhance better teaching and learning of geometry in secondary schools in Rivers State?

Response to items 11 to 20 on the teachers and students questionnaire were used to answer the research question above. The responses were evaluated using mean and are presented in table 6 and 8 respectively.

Table 3. Teachers response on the strategies to enhance better teaching and learning of geometry in secondary schools in Rivers State.

S/N	Items	Responses				Mean Response
		SA	**A**	**D**	**SD**	
11.	The teacher should arouse the interest of the students while introducing the topic.	16	4	-	-	3.53
12.	The teacher should use instructional materials to make the teaching real.	13	16	1	-	3.36
13.	The lesson should be related to real life situation	10	18	1	1	3.23
14.	The learning environment should be made conducive for effective teaching/ learning to take place.	18	12	-	-	3.60
15.	The necessary facilities needed in a school to facilitate teaching/ learning should be made available	15	14	-	1	3.43
16	Teachers should use appropriate method to drive home their lessons	4	15	-	1	3.40
17.	The teacher should endeavour to carry all students along with respect to individual difference	10	16	3	1	3.16
18.	The teacher should make the students do more practical work than theoretical.	18	11	1	-	3.56
19.	The class size should be such that the teacher can manage	15	15	-	-	3.50
20.	Teachers should monitor the activities and performance of their students	13	17	-	-	3.43

The mean response on table 3 shows that the teachers accepted the factors as the strategies that could enhance both teaching and learning of geometry in secondary schools in Rivers State if adopted. The mean values ranges from 3.60 to 3.23 which is in line with the criteria for accepting a factor.

They all agree to the fact that the learning environment should be made conducive for effective teaching and learning to take place.

Table 4. Students' response on the strategies to enhance better teaching and learning of geometry in secondary schools in River State.

S/N	Items	Responses				Mean Response
		SA	**A**	**D**	**SD**	
1.	There should be enough instructional aids to make the teaching real	194	79	19	3	3.63
2.	Topics in geometry should be related to real life situation	87	144	45	19	3.01
3.	The learning environment should be made conducive for effective teaching/learning to take place	198	75	18	6	3.56
4.	Facilities necessary in a school should be made available to facilitate learning	199	81	10	8	3.58
5.	Students should be made to work extra-hard to improve on their poor foundation	185	80	19	8	3.51
6.	Students should be involved in more practical work than theoretical	150	119	18	8	3.39
7	The students should develop a studying habit	215	66	10	6	3.65
8.	There should be willingness to learn	209	86	3	2	3.67
9.	Parents should buy the necessary learning materials for their children	183	99	6	5	3.56
10.	Parents should keep track on the performance of their children	184	96	14	6	3.53

The results as shown in table 4 reveal that all ten strategies listed in the table could enhance better teaching and learning of geometry ins secondary schools.

7.   SUMMARY OF FINDINGS

The study was designed to find out the problems of teaching and learning geometry in secondary schools in Rivers State with a view to making recommendations towards improvement. This becomes necessary in view of the poor performance observed in geometry in mathematics at both internal and external school examinations.

After the analysis of the data collected, the following findings are summarized.

1. The foundation of most mathematics teachers in geometry is poor
2. The students have poor foundation in mathematics, as such cannot solve problem even when similar examples are given.
3. The teaching and learning environment are not conducive. This is in line with lack of infrastructures and basic facilities for teaching and learning.
4. Altitude of students towards learning is very poor. They lack the willingness and readiness to learn.
5. The teachers lack commitment due to lack of motivation
6. It was also found that if the necessary provisions are made and proper monitoring are made on the students and teachers, these problems will be a thing of the past.

8.   RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made.

1. The state government should as a matter of urgency send mathematics teachers for training and seminars for effective teaching of mathematics and geometry in particular in our secondary schools.
2. The government should endeavour to provide the necessary infrastructures and facilities that will motivate teaching and learning of mathematics.
3. Teachers should try as much as possible to relate their lesson to real life situation in order to reduce abstract nature of the subject.
4. The government should come up with packages that will motivate mathematics teacher and reward hardworking teachers and students.
5. The appropriate bodies responsible for the monitoring of teachers and students should be made to leave up to expectations.

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