Geometry Viewed as a Difficult Mathematics

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Abstract:- **Geometry in Senior Secondary School in Cross River State is viewed as a difficult mathematics concept. This study focuses in 450 SS-2 students made up of 230 female and 220 male from 30 schools in Cross River State which were the randomly selected within the three senatorial District. The perceived difficult mathematics concept was study through the instrument of 20-item questionnaire. Three research questions were answered using frequency counts and percentage while the only formulated hypothesis was tested using chi-square (x^2) statistics. Eight out of 20 concept were perceived difficult to the learner, this include coordinate geometry, circle theorem, construction etc and reasons given for viewing geometry concept as difficult is as a result irregular class practices, unavailability of instructional materials, teacher's method of teaching, bad and inadequate timing etc. Student gender quality had a great influence on the learning concepts on geometry at 0.05 level of significant in favour of female students. Approximate teaching method and effective instructional materials should be used to derive a better understanding on the identified difficult geometry concepts.**

I. INTRODUCTION

It is generally acknowledge that mathematics is a subject that cut across other fields. Ayinla (2011) "mathematics is the pillar of all knowledge showing its relevance to all disciplines", Michael (2008) described mathematics as "a language of sciences that allows scientists to communicate ideas using universally accepted terminologies." In Salman (2005) "mathematics is the indispensable tool in the study of science, humanities and technology".

Mathematics is a basic requirement in most of the course in the Nigerian University if not all for admission into year 1. the National Policy on Education FRN (2003) submitted that mathematics is one of the core subject offered by all students at both junior and senior secondary school. Despite the relevance of mathematics, students' performance in the subject in West African Examination (WAEC) and National Examination Council (NECO) has remained constantly poor. Most educated mathematics elite try do their best to identify the hindrance that is given rise to poor performance, and they believe, is the lack of incentive for teachers, unqualified teachers in the system and lack of learner's interest. It is also interesting to note that the students perception of geometry as a difficulty, large number of students in class and psychological fear of the subject can never be rule out as a factor in this poor achievement in mathematics in respect of public examination. In considering the WAEC performance of

May/June students' in Cross River State 2010, 2011, 2012, 2013, 2014 had performance wonderful poor in geometry questions.

Geometry is a branch of mathematics that deals with different figures and their parts. Paulina (2007) Geometry is a branch of mathematics which deals with the study of shapes or figures and their properties. These branches of mathematics play an important role in primary and secondary school mathematics curriculum in Nigeria. Geometry is applicable to the day to day activities of different fields and relevant employment skills. It curriculum is harshly appreciated in science, art and technology.

Lack of poor reasoning skill on geometry, geometry language comprehension, lack of visualizing abilities, teaching method, poor background knowledge, student knowledge on proofs, gender qualities, non-availability of instructional materials among others, contribute to the students perceived difficulty in learning geometry as a mathematics concept.

According to Nigerian Educational Research and Development Council (2012) observed that difficult concepts in mathematics referred to any concept that posed challenges to teachers and learners. Empirical studies on perceived difficult concept in Mathematics have been addressed by some researchers [i.e Beharvard (2001), Uduoson (2011), Hyludo (2002) Gbode and Olaleyi (2006).]

II. STATEMENT OF THE PROBLEM

Studies revealed that difficulty in teaching and learning of mathematics especially geometry has resulted in mass failure in examination (NMC 2009). Adegun and Aalegun (2013) student generally encountered difficulties in geometry and performed poorly in secondary school mathematics lesson. Telima (2012) found out that many students fail to grasp key concepts in geometry and leave math classes without learning basic terminology.

The teaching and learning of geometry is viewed as a difficult mathematics concept as a result of the following factors. The teaching method, geometric language, visualizing abilities (Noramini, 2006 and Axsen 2012). Mason (2002); Udo Usoro (2011); and NERDC (2012) that other factors include non-availability and obsolescence of instructional materials, gender difference, poor reasoning skill, bad and inadequate time, inadequate school curriculum and lack of proof by students. This has a great negative influence on the learner effectiveness in geometry. In respect of gender difference, Adebule (2004) observed that gender has no specific effect on the learning of math and

Udo Usoro (2011) was the opinion that mathematics is gender friendly. Abiam and Odok (2006) found no significant relationship between gender and achievement in number and numeration, algebraic process and statistics.

Report from the chief examiners (2010, 2011, 2012, 2013 and 2014) shows and confirmed weaknesses in mensuration, construction, circle theorems etc. This makes the student performed woefully in the examination. Burlon (1999) "poor performance of student especially in geometry has been in the minds of mathematics educator, parent and the government". A lot of research has shown that geometry as a topic among abstract and complex aspect of mathematics that student find difficulty to learn (Akinlade, 2004). With these obnoxious facts, geometry has been identified as mathematics perceived difficult concept in senior secondary school in Cross River State of Nigeria.

III. PURPOSE OF STUDIES

To identify Geometry as mathematics perceived difficult concept in Senior Secondary School in Cross River State of Nigeria.

The study seeks to
1. The identification of geometry concepts perceived difficult to learn
2. Acceptable causes of the perceived difficult of geometry concepts
3. The level of difficulty of geometry concepts is perceived
4. The gender effect on student's perception of difficult geometry concepts.

➢ *Research Questions*
In this study, answers were provided to the following research questions:
1) What are the topics that are viewed difficult concept in geometry to the Senior Secondary School learner in Cross River State, Nigeria?
2) What are the general acceptable causes of the perceived difficulty in geometry?
3) At what level does geometry difficult concept is perceived
4) Does gender influences student's perception of difficult geometry?

➢ *Research Hypothesis*
Base on the investigation, the null hypothesis was formulated and tested for the study. HO_1: There is no significant difference in the number of geometry concepts perceived difficult in male and female students

➢ *Research Type*
The use of questionnaire for collection of information on the difficult geometry concepts in mathematics was done which is descriptive and survey type population.

IV. SAMPLE AND SAMPLE TECHNIQUES

The population involved is 450 Senior Secondary School Students in Cross River State which was randomly selected and the target population was just the SS2 student from 30 Senior Secondary School from this three senatorial

district. The random sampling techniques involved was effective to come up with the following number of students participation, 180(40%) from the central district, 135(30%) from the south senatorial district and 135 (30%) from Cross River North.

➢ *Research Instrument*
A researcher developed base questionnaire for the perceived difficult geometry concepts in mathematics consist of three different sections, section A contained of respondents personal information, section B contained 20 collected concepts in geometry from Senior Secondary Mathematics Curriculum from which the students were to identify difficult concept perceived to learn. The four (4) alternative responsive include, very difficult, difficult moderately, difficult and not difficult. The last section C contained reason why the concepts were perceived relatively difficult to learn.

➢ *Validation of The Research Instrument*
The questionnaire was given to two experience mathematics educators for proper scrutiny of the instrument for both face and content validity. The reliability of the instrument was determined by the test-retest method with an interval of 3weeks. The trial was done on 50 students from participatory schools in interval of two weeks and data collected was subjected to person product moment correlation coefficient to obtain the reliability index at 0.05 significant as well as have a coefficient of 0.70 which was felt good for the study.

➢ *Procedure For Data Collections*
The questionnaires were administered in the selected schools under the permission of their management. The consent and cooperation of the mathematics teachers, the students that are participating in the study and their parent were sought, through the PTA, before commencing the study. The questionnaire where given to the respondents for accurate response while the completed ones were collected immediately. The completion of the information consent form helped to document their willing to participate in the study and address related in their participation in the study.

V. DATA ANALYSIS AND RESULT

The data collected were analyzed by descriptive and inferential statistics frequency counts and percentages were also used for answering the 3 research question. The chi-square (X^2) as a statistical tool was used to test the only one formulated hypothesis (HO_1) which landed at the tested significant level of 0.05. In the course of analysis "very difficult" "difficult" and "moderately difficult" were merged and classified as difficult. As well as "not difficult" was regarded as easy. The answer questions 1, 2 and 3 include:

➢ *Research Questions 1*
What are the topics that are very difficult concepts in geometry to the SS2 learners in Cross River State, Nigeria?

Table 1: Shows the number of students as respondents that viewed some topics as difficult concepts in geometry. The concepts for which percentage for response for

difficulty falls below 60% are grouped as not difficult (easy) and that which falls in 6.0% or above are grouped as difficult. Out of 20 concept, 8 concept are perceived difficult by the students. They include congruent triangle, circle theorem, construction and locus, surface area of solid figure, volume of solid figure, longitude and latitude, coordinate geometry and bearing and distance. Twelve (12) concepts are viewed not difficult (easy) by the students. They include; triangles, angles and lines, similar triangles, theorems on triangles, circles polygons, quadrilaterals, length, area and parameters of plane figure, areas and sectors of circles, chords and segment angle of elevation and depression in Pythagoras.

S/n	Topic viewed as concepts	Frequency count and % Frequency count number respondents of difficult concept	and percentage of No of respondents of (easy) concept
	Angles and lines	117.00(26.00%)	333 (74.00)
2.	Triangle	108 (24.00%)	342 (76.00)
3.	Theorem of Triangle	243 (54.00%)	208 (46.00)
4.	Similar triangles	261 (58.00%)	189 (42.00%)
5.	Congruent triangles	315 (70.00%)	135 (30%)
6.	Circles	99 (22.00%)	351 (78%)
7.	Polygon	155 (34.00%)	297 (66%)
8.	Quadrilaterals	198 (44.00%)	252 (56%)
9.	Circle theorem	351 (78.00%)	99 (22%)
10.	Construction and locus	405 (90.00%)	45 (10%)
11.	Length, areas and parameter of place figure	171 (38.00%)	279 (62%)
12.	Areas and sector of circle	207 (46.00%)	243 (54%)
13.	Chords and segment of circles	216 (48.00%)	234 (52%)
14.	Surface area of solid figure	342 (76.00%)	108 (24%)
15.	Volume of solid figure	324 (72.40%)	126 (28%)
16.	Longitude and latitude	333 (74.00%)	117 (26%)
17.	Coordinate geometry	378 (84.00%)	72 (16%)
18.	Pythagoras's theorem	189 (42.00%)	261 (58%)
19.	Angle of elevation	126 (28.00%)	324 (72%)
20.	Bearing and distance	342 (76.00%)	108 (24%)
		4878 (1084%)	4122 (916%)

Table 1 Percentage Difficulty Level Of Frequency Counts

➢ *Research Questions 2*

What are the general causes of the perceived difficulty in geometry?

S/n	Reasons	Frequency count	Percentage %
1.	Unavailability of instructional materials/insufficient time allocation	152	33.80%
2.	Teaching method	125	27.80
3.	Complexity	74	16.40
4.	Student gender	55	12.20
5.	Misconception of concept	44	9.80

Table 2:- Shows the frequency counts and percentage of reason adduced by indicates in concepts perceived difficult to learn.

In this table above it is discovered that the unavailability of instructional materials/insufficient time has the highest percentage of (33.40%) as the major reason for perceiving the concepts difficult to learn, while the rest as follows arranged: Teaching method (27.80%), Complexity (16.4%), Students gender (12.20%) an\d misconception of concept has the lowest percentage (9.80%).

> *Research question 3*
   At what observed level does geometry difficult concept is perceived?

S/n	Topic view as concept	Frequency count and no of respondents of difficult conception	Frequence count & no of respondent not difficult (easy)
1.	Angle and line	117	333
2.	Triangles	108	343
3.	Theorem of triangle	243	207
4.	Similar triangle	261	189
5.	Congruent triangle	315	135
6.	Circles	99	351
7.	Polygon	153	297
8.	Quadrilaterals	198	252
9.	Circle theorems	351	99
10.	Construction and locus	405	45
11.	Length, Arcs and Parameter of plane	171	279
12.	Arcs and sector of circles	207	243
13.	Chords and segment of circles	216	234
14.	Surface area of solid figure	342	108
15.	Volume of solid figure	324	126
16.	Longitude and latitude	333	117
17.	Coordinate geometry	378	172
18.	Pythagoras	189	261
19.	Angle of elevation and depression	126	324
20.	Bearing and distance	342	108
	Total	4878 (54.20%)	4122 (45.8)

Table 3:- Below shows frequency count and the members of the respondent of geometry difficult concept.

The table 3 Show's the frequency counts and their number of the respondents of geometry difficult concepts. The frequency counts and percentages of difficult concept line to be 4878 (54.2%), while frequency counts and percentage of not difficult (easy) concepts is 4122 (45.8%) and gave rise to a total of 9000 (100%). The observable level that geometry difficult concepts perceived is at 54.20% while that of not difficult (easy) is 45.80%. This means that difficult generating concept is higher than those perceived not difficult (easy) to learn by the students.

> *Research question 4*
Does gender influences student's perception of difficult geometry concepts?
Ho_1: There is no significant difference in the number of geometry concept perceived difficult by male and female students.

Gender	VD	D	MD	ND	DF	X^2Cal	X^2tab
Male	7.7% 692 628.54	8.5% 765 754.87	9.2% 828 801.60	2.4% 1836 1955.93	3	28.01	7.82
Female	2.1% 695 759.41	9.7% 873 883.13	10.1% 909 935.40	26.7 2403 2283.07			

Table 4

The above table 4 shows that the X^2cal= 28.01 while X^2_{lab}=7.82 with diff=3 at the level of significant of 0.05 since X^2_{cal} value is greater than X^2_{tab} value hypothesis 1 is rejected. This implies that there is a significant difference in the number of geometry concept perceived difficult to learn of male and female students in favour of female students. This finding also provides an answer to research question 4. That is to say gender influence student's perception of difficult geometry concept.

VI. DISCUSSION

Eight out of twenty geometry concepts were perceived difficult to learner while 12 were not perceived difficult by the learner. The reason for perceiving the concept difficult were unavailability instructional materials/insufficient time allocation 152 (35.80%) teaching method 125(27.80%) complexity 74 (16.40%), student gender 55(12.20%) and misconception 44 (9.80%). This result agreed the early findings. The difficulty of geometry concepts perceived difficulty by students was 4878(54.2%) while not difficult (easy) was 4122(45.8%). Female students were favoured by a significant difference in number of geometry concept perceived difficult. This means that female students do

better compare to their male counterpart. This agreed with Kurumeh (2004) and Gimba (2006) who found out that female students performed better them male students when expose to geometry, measurement and 3 dimensional mathematics instruction material respectively.

VII. CONCLUSION

It is believed that;
- The concepts perceived difficult by the learner were eight in number while twelve were also perceived not difficult (easy).
- It is obviously observed that difficulty in the learning of these geometry concepts could be attributed methods of teaching, unavailability of instruction material/insufficient time allocation, student gender, complexity and misconception of concepts.
- The percentage level of difficulty of difficult geometry concepts was 54.2% while that of not difficult (easy) 45.8%.
- Student gender quality had a significant influence on the member of geometry concept perceived difficult by male and female student in favour of female students. This means that female students do better in geometry then male students.

SUGGESTION

Based on these result, those suggestion are consider must be appropriate
- Appropriate teaching method of instruction that match with difficult geometry concept in mathematics should be engaged.
- Government should intervene through Federal and State Ministry of Education, in the provision of relevant instructional material to schools.
- Workshops and seminars should be organized for teacher on how to teach these difficult concepts in geometry.
- Sufficient time should be allocated in the school time table for geometry concepts
- Rearrangements of the geometry concept in school curriculum not to be complex for teacher to teach.

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