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IDENTIFICATION OF DIFFICULT CONCEPTS IN MATHEMATICS AS PERCEIVED BY MATHEMATICS TEACHERS IN SENIOR SECONDARY SCHOOLS IN DELTA STATE

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Abstract: *The study examined teachers' perception of difficult Mathematics topics in senior secondary schools in Oshimili South Local Government Area of Delta State. A total of 50 Mathematics teachers formed the sample for the study, a descriptive survey research was used. The instrument used for data collection was the Mathematics Assessment Questionnaire (MAQ) constructed by the researcher comprising of Mathematics Topics extracted from the WAEC syllabus. Mean and Standard Deviation were used as statistical tools to analyze the research questions while the hypotheses were analyzed using t-test and ANOVA analysis at 0.05 level of significance. The result showed that there is no significant difference in the perceived area of difficulty between teachers in urban and rural areas. The study revealed that there is no significant difference in the perception of difficult topics between male and female teachers. The study showed that there is no significant difference in the perception of difficult topics among teachers with different years of experience. Finally, the study showed that there is no significant difference in the perception of difficult topics among teachers with different qualifications. It recommended that more books especially those containing the difficult topics should be made available in simpler terms and steps. It also recommended that workshops and seminars should be organized for the training and retraining of teachers on the difficult topics in the Mathematics curriculum.*
Keywords: *Mathematics, Concepts and perception.*

Introduction

Mathematics means many and varied things to different people. In view of its universality and diversity, Encarta (2007) defined mathematics as the study of relationship among members, shapes and quantities. Mathematics is the science of size and number of which arithmetic algebra and trigonometry are branches (Kurumeh & Imoko, 2008). It is the creation of human mind, concerned primarily with ideas, processes and reasoning (Odili, 2006).

In addition, Okafor (2005) viewed mathematics as a unified science whose branches are interrelated to each other in such a way that the branch is utilized to the best advantage. In other words, students cannot perform effectively in science in the absence of the knowledge of Mathematics. Mathematics is a tool for character building (Odili 2006) laid emphasis on Mathematics in character building, this could be achieved through active involvement, personal work with others and opportunities for eliminating curiosity, self-expression and self-criticism.

The Nigeria Mathematics curriculum is subject centred as well as student centred. It also emphasizes meeting of learner's development needs and interest. There are evidence to show that the students' cognitive and affective attitude falls below expectation. More recently, Awofala and Fatade (2023) observed that teachers are often singled out as the sole contributors to this poor performance, while the roles of parents, students, and government policy in the problem are rarely examined. Over the time various efforts have been made to ensure that these problems which lead to poor performance in Mathematics are identified and tackled effectively. Some of the key issues affecting poor performance in mathematics could be observed at terminal examinations and their general performance in the question selected. It was observed that students like avoiding questions in some particular topics during examination. According to Azuka (2010) another observed fact is the reoccurring pattern of poor performance in such topics. This is corroborated by Madu (2024), whose recent survey of senior

secondary school students in the North-Western states of Nigeria found that a considerable proportion of Mathematics topics in the WAEC and NECO syllabus were still perceived as difficult. This was because those topics stimulate fear and anxiety on students they were also unpopular topics and require more effort and skill before one can understand and solve them; only few student attempt such questions and they are usually found in section B of theory questions and carry more marks. However, the needs of these learners can only be met by well-equipped teachers who know the rudiments, fundamental, essential and various concepts in Mathematics. Since most secondary school Mathematics teachers have tagged some concepts in Mathematics as difficult and a no-go area, they avoid these concepts and by themselves rule out these topics from the stipulated curriculum given to them. These topic rules out are called the rejected or unimplemented curriculum. This is consistent with the findings of Adeniyi and Akanmu (2020), who identified eleven difficult concepts in the senior secondary school Mathematics curriculum as perceived by teachers, attributing the difficulty to inadequate teacher preparation and poor background knowledge of the affected concepts. It was due to this observation that now having this opportunity of carrying out a research, I decided to find out and identify those difficult concepts in senior secondary schools, see the reasons why they are termed difficult and find out why some teachers perceive them as difficult hence proffer solutions to them.

In conclusion the importance of mathematics in our secondary school curriculum cannot be over-emphasized. Mathematics is a useful tool in the society. The ability to compute, problem solve and apply and apply concepts and skills in Mathematics influences multiple decisions in our lives. Though not all students are expected to become mathematics but because of its applications in everyday life, for a student to be able to function very well within his immediate environment the knowledge of sedimentary mathematics in very necessary.

It was based on this fact that in Nigeria, Mathematics is a compulsory subject at all levels of education and must be credited in the senior secondary certificate examination irrespective of the proposed course of study in tertiary institutions or the prospective choice of career of the student.

Statement of the Problem

Empirical studies identification of difficult topics in senior secondary school certificate Biology syllabus as perceived by students (Oyedukun 2002) identification of students' perceived difficult concepts in senior secondary school Chemistry in Oju Local Government Area of Benue State, Nigeria (Agogo & Onda, 2014) and identification of difficult concepts in senior secondary school two (SS2) Physics curriculum in Rivers State, Nigeria (Obefemi & Onwioduokit, 2013), have reviewed some difficult concept in Biology, Chemistry and Physics. In Mathematics specifically, Akanni (2009) identified similarly perceived difficult concepts among senior secondary school students in Lagos State. Based on the above the study will focus on mathematics.

Researchers have noted that some topics are not too easy to teach by teachers due to its demanding and abstract nature. These are topic which the students also find difficult to grasp and understand. Those topics have the following characteristics. They are hard to understand, they require more effort and skills before one can understand solve them, such topics put fear and anxiety on some teachers, they are unpopular topics consisting mainly abstract topics, they are usually found in section B of theory questions and carry more marks and are usually responsible for the general poor performance of students in Mathematics.

If properly taught, students will discover that they are not difficult as they suppose. These difficult topics can be regarded as slapped topics as the teacher deliberately omits those topics because they do not understand them. Some of those who venture to teach them many leave it in a hurry and teach only the rudiment aspects failing to teach students how to solve questions relevant to the topics. Could the poor performance of students be attributed to inability of students' to understand some concept in

Mathematics? Some of the topics in Mathematics are also perceived difficult by mathematics teachers due to location and gender and years of experience. Sequel to the above, the present study would focus on difficult concept in Mathematics as perceived by Mathematics teachers. Hence, the need for the study.

Purpose of the Study

The purpose of the study is:

1. To identify the difficult concepts in mathematics as perceived by Mathematics teachers in senior secondary schools in Oshimili South local Government Area of Delta State.
2. To determine whether location influences teachers' perception of Mathematical concept.
3. To determine if teachers' perception of difficult concept in Mathematics is gender motivated.
4. To determine if teachers' years of experience influence their perception of difficult concepts.
5. To determine if qualification of teachers' influence their perception of difficult concepts.

Research Questions

To effectively identify the perception of Mathematics teachers in senior secondary schools towards the difficult concepts in Mathematics, the following research questions were raised to guide the study:

1. What are the topics in senior secondary mathematics that are perceived difficult by Mathematics teachers?
2. To what extent does location influence teacher perception of difficult concepts in the Mathematics curriculum?
3. To what extent does gender influence teachers perception of difficult concept in Mathematics in senior secondary schools?
4. To what extent does years of experience influence teachers' perception of difficult concept in Mathematics in senior secondary school?
5. To what extent does qualification of teachers' influence their perception of difficult concept in Mathematics in senior secondary school?

Hypotheses

The following research hypotheses were tested in this study:

HO_1: There is no significant difference in the perceived area of difficult topics between teachers in urban and rural area.

HO_2: There is no significant difference in the perception of difficult topics between male and female Mathematics teachers.

HO_3: There is no significant difference in the perception of difficult topics among teachers with difference years of experience.

HO_4: There is no significant difference in the perception of difficult topics between teachers with different qualification.

Methodology

The research adopted a descriptive survey design. The descriptive survey research is generally conceived as a type of research in which the targeted population is studied by collecting, analyzing and describing data from the sample which is considered to be a representative of the entire population. It involves a wide spread and large population in which the researcher cannot reach all the elements. Hence a selected segment (sample) of the population is collected for an investigation after which the result is generalized across the entire population. Thus, the study is meant to identify the difficult concepts in mathematics as perceived by mathematics teachers in senior secondary schools. The population of the study comprises 120 Mathematics teachers in senior secondary schools in Oshimili South local Government Area of Delta State. The proportional random sampling technique was used in selecting the Mathematics teachers from senior secondary schools in Oshimili South local Government Area of Delta State and the numbers of respondents selected were 50 comprising of 27 male teachers and 23 female teachers. The instrument used for data collection is the mathematics Assessment Questionnaire (MTAQ) constructed

by the researcher comprising of all mathematics topics in senior secondary school extracted from the WAEC syllabus section A of the (MTAQ) is on bio-data information such as name of the school sex, school location, Qualification and years of experience. Section B consists of all topics in the WAEC syllabus covering numbers and numeration algebraic processes, geometric and measured trigonometry, statistics and introductory calculus. The questionnaire is a 4-point likert scale type, with response option: Very easy (VE), easy (E), Difficult (D), Very Difficult (VD). The responded is expected to respond by ticking (√) any option that is appropriate. The instruments for data collection were administered face-to-face with the help of research assistants. At the end of the administration their responses were collected by the researcher and with the help of research assistants. This ensured high percentage of the instrument returned.

The research question 1 was answered using mean and standard deviation. Topics with mean ≥ 2.5 were rated difficult while topics with mean < 2.5 were rated easy/ not difficult. Research questions 2-5 were also answered using mean and standard deviation. Research hypothesis 1 and 2 were tested using the students t-test, while hypothesis 3 and 4 were tested using one-way ANOVA at 0.05 degree of freedom.

Results and Analysis

Research Question 1: What are the topics in senior secondary mathematics that are perceived difficult by mathematics teachers?

In answering the above question, analyzed data result from data collected are presented in table 1 below

Table 1: Means and standard deviation responses on the topics of the senior secondary mathematics curriculum, mathematics teachers find difficult.

S/N	Topics	Mean	Standard deviation	Decision
1	Number bases	1.54	0.646	Easy
2	Modular Arithmetic	1.94	0.652	Easy
3	Fractions, Decimals and Approximations	1.44	0.541	Easy
4	Indices and Powers	1.72	0.607	Easy
5	Logarithms of numbers	2.30	0.839	Easy
6	Sequence and series	2.18	0.800	Easy
7	Set	2.26	0.803	Easy
8	Surds	2.78	0.864	Difficult
9	Matrices and Determinants	2.66	0.939	Difficult
10	Positive and negative integers rational numbers	2.56	0.837	Difficult
11	Logical reasoning	2.48	0.814	Easy
12	Approximation and percentage error	1.96	0.755	Easy
13	Ratio, proportions and rates	1.82	0.748	Easy
14	Percentages and simple interest	1.42	0.538	Easy
15	Financial mathematics	2.44	0.833	Easy
16	Variation	2.20	0.833	Easy
17	Algebraic expressions	2.02	0.845	Easy
18	Quadratic equations	1.96	0.947	Easy
19	Graphs of linear and quadratic equations	2.52	0.174	Difficult
20	Linear inequalities	2.28	0.882	Easy
21	Algebraic fractions	2.20	0.782	Easy
22	Functions and relations	2.48	0.995	Easy
23	Mensuration	2.24	0.744	Easy
24	Lines and Angles	2.46	0.885	Easy
25	Angles and Intercepts on parallel	2.86	0.808	Difficult

S/N	Topics	Mean	Standard deviation	Decision
26	Triangles and polygons	2.16	0.792	Easy
27	Circles	2.00	0.728	Easy
28	Construction	2.54	0.930	Difficult
29	Loci	3.00	0.857	Difficult
30	Coordinate geometry of straight lines	2.74	0.965	Difficult
31	Sine, cosine and tangent of an angle	2.48	0.885	Easy
32	Angles of elevation and Depression	2.62	0.901	Difficult
33	Bearings	2.72	0.757	Difficult
34	Latitude and longitude	2.72	0.904	Difficult
35	Differentiation of algebraic functions	2.54	0.952	Difficult
36	Integration of simple Algebraic functions	2.64	0.827	Difficult
37	Statistics	2.08	0.922	Easy
38	Probability	2.06	0.793	Easy
39	Vectors in a plane	2.84	0.710	Difficult
40	Transformation of vectors in the cartesian plane	3.20	0.833	Difficult
	Grand total	2.33	0.405	Easy

From the above table, the following topics: surds, matrices and determinants, Graphs of linear and quadratic equations, Angles and intercepts on parallel, Construction, Loci, Co-ordinate geometry of straight lines, Angles of elevation and depression, Bearings, Latitude and longitude, Differentiation of algebraic functions, Integration of simple Algebraic functions, Vectors in a plane and Transformations of vectors in the cartesian plane are perceived difficult to teach by the sampled mathematics teachers since the items mean are greater than 2.5 while other topics are considered easy to teach.
Table1 above also revealed a grand mean of 2.33 and standard deviation of 0.41 which indicate that most of the topics in the mathematics curriculum are easy to teach compared to those that are difficult.

Research Question 2: To what extent does location influence teacher perception of difficult concepts in the mathematics curriculum?
Descriptive mean and standard deviation from data collected in respect of the above research question are presented in table 2 below.

Table 2: Mean and standard deviation of teachers' location influence on perceived area of difficulty in the mathematics curriculum.

Location	N	Mean	Standard Deviation
Rural	17	2.29	0.39
Urban	33	2.34	0.42
Total	**50**	**2.32**	**0.40**

Table 2 shows that the mean of rural and urban teachers are 2.29 and 2.34 respectively with standard deviation 0.39 and 0.42 respectively. This indicates that location of service/work has no influence on perceived difficulty in the mathematics curriculum.

Research Question 3: To what extent does gender of teacher influence perceived area of difficult topics in senior secondary schools?
Descriptive statistics of Mean and standard deviation from data collected in respect of the above research question are presented in table 3 below.

Table 3: Means and Standard deviations of teachers' gender influence on perceived areas of difficulty in the new senior secondary mathematics curriculum.

Sex	N	Mean	Standard Deviation

Male	27	2.33	0.38
Female	23	2.34	0.44
Total	**50**	**2.32**	**0.40**

Table 3 shows that the mean of male and female teachers are 2.33 and 2.34 respectively with standard deviation of 0.38 and 0.44 respectively. This indicates that gender has no significant influence on perceived difficulty in the mathematics curriculum.

Research Question 4: To what extent does length of experience influence teachers' perception of difficult concept in mathematics in senior secondary school?
In answering the above research question descriptive statistics of mean and standard deviation from data collected are presented in table 4 below.

Table 4: Mean and standard deviation of teachers' years of experience influenced on perceived areas of difficulty in the new senior secondary mathematics curriculum

Experience	N	Mean	Standard Deviation
Below 5 years	3	2.24	0.77
5 – 9 years	17	2.33	0.32
10 years and above	30	2.33	0.42
Total	**50**	**2.33**	**0.40**

Table 4 shows that the mean scores of below 5 years 5-9years, and 10years and above are 2.24, 2.33 and 2.33 respectively with standard deviation 0.77, 0.32, and 0.42 respectively.
This indicates that years of experience has no significant influence on perceived area of difficulty in the mathematics curriculum.

Research Question 5: To what extent does qualification influence teachers' perception of difficult concept in mathematics in senior secondary school?
in answering the above research question, mean and standard deviation from data collected in respect to the above research question are presented in table 5 below.

Table 5: Mean and standard deviation of teachers' qualification influence on perceived difficult areas in the senior secondary mathematics curriculum.

Qualification	N	Mean	Standard Deviation
Rural	7	2.27	0.44
Degree	38	2.33	0.41
Masters	5	2.34	0.44
Total	**50**	**2.33**	**0.40**

Table 5 shows that the mean scores of NCE, Degree, and masters are 2.27, 2.33 and 2.34 respectively with standard deviation 0.44, 0.41 and 0.44 respectively. This indicates that academic qualification has no significant influence on perceived area of difficulty in the mathematics curriculum.

Hypothesis 1: There is no significant difference in the perceived area of difficulty on the mathematics curriculum between teachers in urban and rural areas.

Table 6: A t-test comparison of mean difference between rural and urban teachers perception of difficult topics in the new senior secondary mathematics curriculum

Group	N	Mean	Std. Deviation	Df	t-cal	t-crit	Pvalue	Decision
Rural	17	2.29	0.39					Not Significant
Urban	33	2.34	0.42	48	-0.421	±2.01	0.676	

P > 0.05

Table 6 above revealed a t-calculated value of -0.421 and a t-critical value of ± 2.01. Since the t-calculated value of -0.421 falls within the region of non-rejection, hence the null hypothesis is not rejected which implies that there is no significant difference in the perceived area of difficulty in the mathematics curriculum between teachers in urban and rural area.

Hypothesis 2: There is no significant difference in the perception of difficult topics between male and female mathematics teachers.

Table 7: A t-test comparison of mean difference between male and female teachers perception of difficult topics in the new senior secondary mathematics curriculum.

Group	N	Mean	Std. Deviation	df	t-cal	t-crit	Pvalue	Decision
Male	27	2.33	0.38					Not Significant
Female	23	2.39	0.44	48	0.024	±2.01	0.981	

P > 0.05

Table 7 above revealed a t-calculated value of 0.024 and a t-critical value of ± 2.01. Since the t-calculated value of 0.024 falls within the region of non-rejection, hence the null hypothesis is not rejected which implies that there is no significant difference in the perception of difficult topics between male and female teachers.

Hypotheses 3: There is no significant difference in the perception of difficult topics among teachers with difference years of experience.

Table 8: Analysis of Variance (ANOVA) Summary of mean difference in perception of difficult topics among mathematics teachers with respect to their years of experience

	Sum of squares	Df	Mean square	F	P value	Decision
Between groups	0.023	2	0.011	0.067	0.935	Not Significant
Within groups	8.009	47	0.170			
Total	8.032	49				

P > 0.05

Table 8 above, reveals a p value of 0.935 which is greater than the level of significant of 0.05 i.e. P > 0.05 hence the hull hypothesis is not rejected, which implies that there is no significant difference in the perception of difficult topics among teachers with different years of experience.

Hypotheses 4: There is no significant difference in the perception of difficult topics between teachers with different qualification.

Table 9: Analysis of Variance (ANOVA) Summary of mean difference in perception of difficult topics among mathematics teachers with respect to qualification

	Sum of squares	Df	Mean square	F	P value	Decision
Between groups	0.023	2	0.014			Not Significant
Within groups	8.004	47	0.170	0.082	0.921	
Total	8.032	49				

P > 0.05

Table 9 above, reveals a p-value of 0.921 which is greater than the level of significance of 0.05 i.e. P >0.05 hence the null hypothesis is not rejected which implies that there is no significant difference in the perception of difficult topics among teachers with different qualifications.

Discussion of Findings

The study was conducted to ascertain teachers' perception of difficult concepts in mathematics as perceived by mathematics teachers in senior secondary schools. Findings of this study revealed that the following topics were perceived difficult to teach by mathematics teachers: surds, matrices and determinants, Graphs of linear and quadratic equations, Angles and intercepts on parallel, Construction, Loci, Co-ordinate geometry of straight lines, Angles of elevation and depression, Bearings, Latitude and longitude, Differentiation of algebraic functions, Integration of simple Algebraic functions, Vectors in a plane and Transformations of vectors in the Cartesian plane. The study also revealed that this perceived areas of difficulty were not influenced by location, gender of the teacher, years of experience and qualification. However since the grand mean was 2.33 most of the topics in the mathematics curriculum were found easy to teach compared to those that were difficult.

Conclusion

Based on the results obtained from the research questions and hypotheses of this study, the following conclusions were drawn.

1. Teachers find the following topics difficult; surds, matrices and determinants, Graphs of linear and quadratic equations, Angles and intercepts on parallel, Construction, Loci, Co-ordinate geometry of straight lines, Angles of elevation and depression, Bearings, Latitude and longitude, Differentiation of algebraic functions, Integration of simple Algebraic functions, Vectors in a plane and Transformations of vectors in the Cartesian plane.
2. Location, gender, years of experience and academic qualification of the teachers has no significant influence on perception of difficult topics in the mathematics curriculum.

Recommendations

With regards to the findings of this study the following recommendations were made.

1. More books especially those containing the difficult topics should be made available in simpler terms and those topics should be broken dawn with easy steps and procedures.
2. Workshops and seminars should be organized for the training and retraining of teachers on the difficult topics in the mathematics curriculum.
3. Teaching modules/guides should be provided to the teachers on the topics in the curriculum.
4. More time should be allocated for the teaching of mathematics this is to enable the teachers to be well prepared for the task and enhance learning effectively.
5. More teachers should be employed to complement the existing ones in the teaching of mathematic so that the burden of the topics will not be too much.

6. Teachers should always adhere to the pace of the students understanding when teaching the difficult topics. This will help in tackling the individual differences among students.

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