DIFFICULT CONCEPTS IN NIGERIAN SENIOR SECONDARY SCHOOL MATHEMATICS CURRICULUM AS PERCEIVED BY STUDENTS

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Abstract

This paper examined students' perceived difficult concepts in Nigerian Secondary School Curriculum in Nigeria. The population for the study was all Senior Secondary School Students in Education district VI of Lagos State. The sample consisted of 250 SSS3 students selected from science, art, and commercial classes using stratified random sampling techniques. The instrument for data collection was a researcher designed questionnaire titled Difficult Concept Identification Questionnaire in Mathematics (DCIQM) with a reliability value of 0.74. The instrument was based on the current national Mathematics curriculum for senior secondary school. Frequency counts and mean were used to analyzing the data collected. The study revealed that students have difficulties in handing some concepts in mathematics especially the application of different concepts in mathematics. Besides, the study also discovered that most teachers deliberately jump some recommended topics in the curriculum. The study recommended among other that teachers should ensure that all required topics in the syllabus are properly treated and learner-centered method should be employed in the teaching of mathematics to allow active students participation and easy assimilation of mathematical concepts

Keywords: Perceived difficult, concept, curriculum, implementation, performance

Introduction

The curriculum can be defined as the medium through which educational institutions seek to translate the societal values into concrete reality. The school curriculum is a dynamic and open document that is constantly changing with the needs and aspirations of the society (Alade, 2011). The school curriculum of any nation is drawn to achieve a fulfillment of the philosophy of education of the nation and directly linked with the needs of the country. However, the quantity of the education system of a country depends significantly on the quality of its curriculum. Mathematics curriculum, therefore, represents the total learning experiences that learners must acquire in mathematics to achieve the goal of education at a particular level of education.

Mathematics is a subject that has a direct connection with other subjects especially sciences and technical subjects. The position occupied by Mathematics in the scientific and technological development of any nation has made the subject indispensable among all school subjects especially at the basic level of education. For

instance, Mathematics is a compulsory subject for all learners at pre-basic, basic, and post-basic education. Umameh, (2011) viewed Mathematics as a substratum and essential tool for economic, scientific, technological advancement of any nation. Mathematics is an important subject not just because of getting an academic qualification at school but to prepare the students for the future as the knowledge of Mathematics is essential in our day to day activities. According to Maliki, Ngban, and Ibu (2009), Mathematics can be described as a subject that has an impact on all aspects of human life at different degrees. The main objectives of teaching Mathematics at post-basic schools in Nigeria as stated by National policy of Education FRN (2004) include;

(i) To generate interest in mathematics and provide a solid foundation for everyday living.
(ii) To develop computational skills.
(iii) To foster the desired and ability to be accurate to a degree relevant to the problem at hand.
(iv) To develop logical and abstract thinking.
(v) To develop the ability to recognize problems and to solve them with related mathematical knowledge.
(vi) To provide the necessary mathematical background for further education.
(vii) To stimulate and encourage creativity.

Despite the notable impact of Mathematics knowledge among our society, students' achievements in the subject are still far below expectations especially in external examinations such as National Examination Council (NECO) and West African Examination Council (WAEC) among others (Adeleke 2007 and Adeniyi, 2012). The concerned stakeholders have made various efforts to combat different problems which have contributed to poor achievements in Mathematics as well as poor attitude towards the subject. Some of the key issues affecting poor performance in Mathematics as identified by scholars such as (Batiku, 2002; Adedayo, 2006; Adeleke 2007; Adeniyi, 2012; Akinoso, 2016; Ogunleye & Akinoso, 2016) include; poor students attitude, poor teaching strategies, ill preparation on the part of the teachers, in completion of required syllabus, lack of solid foundation in mathematics, large class size, and teachers attitude.

Aminu (2005) carried out a study on the Problems of Mathematics Teaching in Primary and Junior Secondary Schools in Bauchi State, Nigeria. His findings revealed that some recommended topics in the syllabus are left untaught by the teachers, while some decide to teach topics not included in the syllabus. His findings revealed teachers' attitudes to teaching, teachers' incompetency, unconducive teaching and learning environment, students with a poor background in Mathematics, inadequate provision of relevant instructional materials, and teachers' lack of commitment as the causes of these problems. Besides, Jack (2005) opined that students' involvement in examination malpractice could be linked to inadequate implementation of curriculum content while Kolawole, and Oluwatayo, (2004); Adedayo (2006) opined that significant association exists between curriculum implementation and student's academic performance.

Students are likely to have issues with topics that are not treated or ill-treated by the teachers especially in subjects like Mathematics that involve calculations. Researchers such as Jimoh (2003); Achor and Gongden (2011); Agogo and Onda (2014) discovered through their studies that, some topics in chemistry syllabus are difficult to teach by teachers as a result of the abstract nature of the content. Their studies, also revealed that students find it difficult to comprehend most of the topics which teacher perceived difficult. Besides, most students avoid questions on such topics because most of these topics are skillful and demands more effort before one can understand them. Few students who venture into attempting questions on such topics usually perform poorly in them (Jimoh, 2003; Oyedokun, 2002). Therefore, it is very essential to identify those topics which students perceived as difficult in Mathematics curriculum to focus on how to make them more interactive and easier for the learners to learn and assimilate. Hence, this study focuses on the identification of difficult concepts in Senior Secondary School Mathematics Curriculum as perceived by students

Objectives of the Study

The purpose of the study was to investigate the difficult concepts in the senior secondary school Mathematics curriculum as perceived by students. Specifically, it was set out to:

1. Find out the difficult concepts in Mathematics in the senior secondary school curriculum as perceived by the students.
2. Ascertain the causes of the identified difficult Mathematics concepts in the senior secondary school curriculum as perceived by the students.

Research Questions

The following research questions guided the study:

1. What Mathematics concepts do students perceive difficult in the senior secondary school Mathematics curriculum?
2. What are the possible causes of the identified difficult Mathematics concepts in the senior secondary school curriculum as perceived by the students?

Methodology

A descriptive survey design was adopted for the study using the Difficult Concept Identification Questionnaire in Mathematics (DCIQM). The population of this study was all public senior secondary school students in Education District VI of Lagos State, Nigeria. This district was randomly selected from six educational districts in Lagos state. Ten senior secondary schools were then selected randomly selected from 104 senior secondary schools in the district. The sample size of this study consisted of two hundred and fifty (250) SS3 students were selected from ten public senior secondary schools in Education District VI in Lagos State using a stratified sampling technique

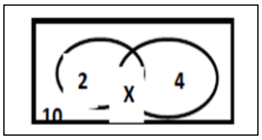
The instrument was based on the current national Mathematics curriculum for senior secondary school. The DCIQM was a researcher constructed and made up of two sections. Section A of the questionnaire was on respondent bio-data Section B measured the difficult Mathematics concepts as perceived by students and possible causes of the identified concept difficulty. Section B part I was made up of twenty-one items on a 4-point scale of Very Difficult (VD) = 4, Difficult (D) = 3, Less Difficult (LD) = 2 and Not Difficult (ND) =1. Section B part II was made up of ten items on a 4-point Likert scale of Strongly Agree = 4, Agree = 3, Disagree = 2, and Strongly Disagree =1 for positive questions while the score is the other way round for negatively worded questions. The instrument was trial tested using a school in Education District II of Lagos state and the reliability coefficient of 0.74 was obtained using Cronbach alpha. The data collected were analyzed using frequency counts and mean. The mean value of any items greater or equal to 2.5 was considered an agreed decision for an item on a point Likert scale (4+3+2+1=10/4=2.5).

Results

RQ1: What Mathematics concepts do students perceive as difficult in the senior secondary school Mathematics curriculum?

Table 1: Students Perceived Difficult Concepts in Secondary School Mathematics Curriculum

S/NO	Topics	VD	D	LD	ND	Mean	Decision
1	Number Base System - Conversion of decimal fraction from other bases to base 10	10	05	30	205	1.18	Not Difficult
	Apply Number Base in Computer Programming	23	45	23	159	1.73	Not Difficult
2	Modular arithmetic - Simple or basic operations	11		57	182	1.36	Not Difficult
	Solving Problems in Standard Form	10	11	68	161	1.36	Not Difficult
	Laws of indices and Problems involving indices e.g. ax x ay = ax+y etc.	11	45	45	149	1.67	Not Difficult
3	Logarithms - Indices and logarithms	11	68	46	125	1.86	Not Difficult
	Graphs of y = 10x	56	80	80	34	2.63	Difficult
	Use of logarithm tables in calculation division powers and roots e.g. 214.3 x 3√308	11	57	102	80	2.00	Not Difficult
	solve problems related to the capital market (Application of logarithms)	69	91	45	45	2.74	Difficult
4	Set theory - Identify types of set	11	80	57	102	2.00	Not Difficult
	Use of Venn diagram	11	68	114	57	2.13	Not Difficult

	Use Venn diagram to solve real-life problems - E.g. Find x?  	34	80	80	56	2.37	Not Difficult
5	Simple Equations and variations. - Problems involving inverse variation	10	102	58	80	2.09	Not Difficult
	Joint variation	11	102	80	57	2.27	Not Difficult
	Application of variation	34	80	68	68	2.62	Difficult
	Simple equations and variations	11	34	114	91	1.79	Not Difficult
	Simultaneous Equation	20	10	80	140	1.32	Not Difficult
	Quadratic equation:	10	11	91	138	1.45	Not Difficult
	Factorization of Quadratic Equation	16	12	102	120	1.50	Not Difficult
	One linear one quadratic simultaneous equation.	23	45	91	91	2.00	Not Difficult
	Forming Quadratic equations with known roots	23	68	91	68	2.18	Not Difficult
	Solve word problems in the Quadratic Equation.	23	102	91	34	2.93	Difficult
6	Construction - Bisection of lines and angles	45	45	92	68	2.27	Not Difficult
	Constructing angles	22	34	114	80	1.99	Not Difficult
	- Construction of equidistance point	91	68	68	23	2.91	Difficult
	Locus of moving points	80	57	91	22	2.78	Difficult
	Proofs of some Basic theorems	57	113	80		2.91	Difficult
7	Trigonometrical ratio - Solve problems involving the use of sine and cosine formula.	23	45	80	102	1.96	Not Difficult
	Ratios of 30, 40 and 60	23	45	68	114	1.91	Not Difficult
	Solving problems using Trigonometrical Ratios	34	22	114	80	2.04	Not Difficult
	Drawing graphs of sine and cosine of angles.	57	68	68	57	2.50	Difficult
8	Mensuration. - Find the length of arc practically	34	57	91	68	2.23	Not Difficult
	Determine the perimeter of a circle, segments of circles	34	57	68	91	2.14	Not Difficult
	- Length of arcs using formula	34	57	57	102	2.09	Not Difficult
	- Area of a sector	11	91	46	102	2.04	Not Difficult
	Find the area of a triangle and subtract the area of circle e.g.	34	57	45	114	2.04	Not Difficult
	Relationship between the surface area of a cone and sector of a circle.	22	80	91	57	2.27	Not Difficult
9	Statistics - Construction of frequency distribution curve, histograms, bar chart and line graphs; pie chart	34	11	68	136	1.76	Not Difficult

	Frequency polygon (Ogive)	11	23	114	102	1.77	Not Difficult
10	Approximations	11	17	40	182	1.36	Not Difficult
	- Calculate percentage errors						
	Degree of accuracy	33	80	57	80	2.26	Not Difficult
11	Sequence and series	16	11	30	193	1.27	Not Difficult
	- Arithmetic progression						
	Geometric progression	11	23	46	170	1.50	Not Difficult
	Practical problems on AP and G.P	23	45	68	114	1.91	Not Difficult
12	Graphical solutions of	11	57	148	34	2.18	Not Difficult
	- Quadratic and simultaneous equations						
	The gradient of a curve	11	57	114	68	2.04	Not Difficult
	- Drawing tangents to a curve, at a given point.						
13	Inequalities, graphs, and problems in inequalities.	12	68	102	68	2.10	Not Difficult
	- Linear inequalities in two variables						
	Deducing maximum and minimum values of inequality graphs	23	80	102	45	2.32	Not Difficult
	Introduction to linear programming	11	91	103	45	2.27	Not Difficult
14	Mensuration II: Chord and theorems: Angles subtended at the center, Angles subtended by chords in a circle, Angles in alternate segments.	68	68	103	11	2.77	Difficult
15	Circle theorems – Angles at the centre is twice that at the circumference	80	68	80	22	2.82	Difficult
	- Problems involving circle theorems						
16	Derivation of sine and cosine rule.	56	80	34	80	2.45	Not Difficult
	- Bearings – the angle of elevation and depression.						
	Practical problems on bearings.	45	45	68	92	2.17	Not Difficult
17	Measures of central tendency – mean, median, mode of ungrouped data.	34	23	45	148	1.77	Not Difficult
	- Def. of range, variance, standard deviation practical application in capital market reports.						
	Areas of applications	11	68	80	91	2.00	Not Difficult
18	The concept of probability	68	34	68	80	2.36	Not Difficult
	- Practical example; list chance instruments (dice, coin, pack of playing cards)						
19	Matrices and Determinants	68	57	57	68	2.5	Difficult
	- Transpose of determinants						
	Solving simultaneous equations using determinants	57	57	57	79	2.37	Not Difficult
	Addition and multiplication of matrices	56	34	80	80	2.64	Difficult
20	Arithmetic of finance	57	23	90	80	2.23	Not Difficult
	- Simple and compound interest						
		79	57	57	57	2.63	Difficult
	Depreciation and rate of depreciation						
	Amortization	68	68	91	23	2.72	Difficult
	- Problems in the capital market using	45	91	57	57	2.50	Difficult

	logarithm table						
21	Longitude and latitude	80	23	90	57	2.50	Difficult
	- Problems on longitude and latitude						
	Co-ordinate geometry of straight lines	45	80	68	57	2.45	Not Difficult
	Distance between points	91	34	80	45	2.68	Difficult
	- Gradient and intercept of a straight line.	57	68	80	45	2.55	Difficult

Acceptance criterion mean $\bar{x} \geq 2.5$

From Table **1** above, it was discovered that concepts such as Graphs of y=10x ($\bar{x}$: 2.63 > 2.50), Solving problems related to the capital market (Application of logarithms) ($\bar{x}$: 2.74 > 2.50), Construction of equidistance point ($\bar{x}$: 2.91 > 2.50), Locus of moving points ($\bar{x}$: 2.78 > 2.50), Proofs of some Basic theorems ($\bar{x}$: 2.91 > 2.50), Drawing graphs of sine and cosine of angles ($\bar{x}$: 2.50 >= 2.50), application of variation ($\bar{x}$: 2.62 > 2.50) and word problems involving quadratic equation ($\bar{x}$: 2.93 > 2.50) are all identified as difficult concepts by students.

Furthermore, the table also revealed that students also had difficulties with the tackling problems on Longitude and Latitude ($\bar{x}$: 2.50 >= 2.50), Distance between points ($\bar{x}$: 2.68 > 2.50), Gradient and intercept of a straight line ($\bar{x}$: 2.55 > 2.50), proving of theorems: ($\bar{x}$: 2.77 > 2.50), and solving problems involving circle theorems ($\bar{x}$: 2.82 > 2.50). They also had some difficulty in solving Matrices and Determinants – Transpose of determinants ($\bar{x}$: 2.50 >= 2.50), Addition and multiplication of matrices ($\bar{x}$: 2.64 > 2.50). A lot of students are not familiar with the concepts of Depreciation and rate of depreciation ($\bar{x}$: 2.63 > 2.50), Amortization ($\bar{x}$: 2.72 > 2.50), Problems in the capital market using logarithm table ($\bar{x}$: 2.50 >= 2.50). All the concepts above are identified by the sampled students as a difficult concept in the secondary school Mathematics curriculum. The implication of this is that students' problem-solving skills and understanding of these concepts are inadequate. It could be deduced from the findings that students lack an understanding of concepts application and questions involving word problems.

RQ2: What are the possible causes of the identified difficult concepts in the senior secondary school curriculum as perceived by the students?

Table 2: Causes of the Identified Difficult Concepts in the Senior Secondary School Mathematics Curriculum

S/NO	Concepts	SA	A	D	SD	Mean	Decision
1	Lack of Mathematics teachers in the school	12	35	60	143	1.66	Disagree
2	Non-completion of Mathematics scheme of work.	36	119	71	24	2.90	Agreed
3	Not relating Mathematics concepts to a real-life situation.	50	119	48	33	2.74	Agreed
4	Deliberate skipping of some Mathematics concepts by teachers	12	83	36	119	1.95	Agreed
5	My teacher does not teach well	71	95	48	36	2.58	Agreed
6	Some Mathematics concepts do not interest me.	94	60	48	48	2.80	Agreed
7	No one to help when faced with difficult problems in Mathematics	71	51	48	71	2.51	Agreed
8	Non-marking and correction of assignment to find out students' strengths and weaknesses in Mathematics	71	36	60	83	2.38	Disagree
9	I do not have a solid foundation in Mathematics	131	36	24	60	2.56	Agreed
10	I have the believe that Mathematics is difficult	36	36	24	154	1.82	Disagree

Acceptance criterion mean: $\bar{x} \geq 2.5$

From table 2 above, eight out of ten items listed on what can make Mathematics concept to be difficult for students were identified by the sampled students as the causes of the difficulties. The identified reason includes; non-marking and correction of assignment, ill background in Mathematics, inability to relate Mathematics concept to real-life, skipping of some topics by teachers, lack of interest in some Mathematics topics, teacher's bad method of teaching and not getting help when faced with a challenging problem in Mathematics.

Discussion of Findings

The findings of the study revealed that students have challenges with some concepts in the senior secondary school Mathematics curriculum. The concept

identified as a difficult concept by students is problems related to the capital market, application of logarithms, construction of equidistance point, locus of moving points, proofs of some basic theorems, drawing graphs of sine and cosine of angles, application of variation, word problems involving quadratic equation, problems on longitude and latitude, distance between points, gradient and intercept of a straight line, solving problems involving circle theorems, matrices, and determinants, addition and multiplication of matrices, concepts of depreciation, amortization and problems on the capital market using logarithm table. This finding is similar to that of Jimoh (2003); Uchegbu, Anozie, Mbadiugha, and Njoku (2015) who affirmed that students find some topics in secondary school chemistry difficult.

From the findings, it can be deduced that teachers' teaching methods, teachers' inability to carry out their duties as expected are part of the factors that contributed to the challenges students faced in Mathematics. For instance, the students identified irregular marking of assignment, non-completion of the syllabus, and deliberate skipping of some topic as part of the causes that led to an inability to do well or perform to expectation in Mathematics. This finding corroborates the findings of Ruffell, Mason, and Allen, 2008; Adeniyi, 2012; Rao, Moely, and Sachs 2012; Uchegbu, Oguma, Elenwoke and Ogbuagu, 2016.

Conclusion

From the findings of the study, it can be concluded that students found most Mathematics concepts in the SSS curriculum difficult as they identified eighteen of the concepts in the curriculum of an as difficult concept. The study also revealed that most teachers do not mark nor correct students' assignments regularly. This will not allow the students to know their strengths and weakness in the topic taught. The study also showed that most teachers failed to cover the required topics in the syllabus. Skipping of required topics by teachers could have many undertones but when a teacher dogged a topic this act will not be of help for the students.

Recommendations

Based on the findings the following recommendations were made;

1. The teachers should ensure that all required topics in the syllabus are properly treated
2. The learner-centered method should be employed in the teaching of mathematics to allow active students participation and easy assimilation of mathematical concepts
3. The government should take refresher courses and workshop a regular event for Mathematics teachers to make them remember those topics/concepts that are already fading away from memory.

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