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DIFFICULT CONCEPTS IDENTIFICATION IN MATHEMATICS CURRICULUM BY NIGERIAN SENIOR SECONDARY SCHOOL MATHEMATICS TEACHERS

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Abstract

The study examined the difficult Concepts in Nigeria Senior Secondary School (SSS) Mathematics Curriculum as identified by the teachers. The population for the study comprised of all Mathematics teachers in Senior Secondary Schools in Lagos State. The sample for the study was selected from the Education District I &VI. The two districts were selected randomly from the six Educational Districts in Lagos State. One hundred and twenty (120) SS2 and SS3 mathematics teachers *were purposefully selected from the sampled districts. The instrument for data collection was a researcher designed questionnaire titled Difficult Concept Identification in Mathematics (DCIMQ).* The reliability coefficient of 0.74 was obtained using Cronbach alpha. *The data collected were analyzed using frequency counts and mean. The study showed that teachers identified eleven different concepts as difficult concepts in the SSS mathematics curriculum. Besides, the teacher identified the following as the factors responsible for the identified difficult concepts; inadequate teacher curriculum, lack of adequate problem-solving skills, poor background in some mathematics concepts among others. Hence, the study recommended that the teacher education curriculum should be overhauled to include revision of some concepts in the senior secondary school mathematics curriculum. Also, teachers should be sensitized to make a personal effort to develop themselves adequately in their specialized subjects.*

Introduction

A teacher is a trained licensed professional who is saddled with the responsibilities of impacting/facilitating knowledge. A facilitator of knowledge should be someone who is well informed about the instruction and the content. This is because it is practically impossible for someone to give others what he/she does not possess. Adegoke (2004) defined a teacher as a properly trained, certificated, registered and licensed professional who has attended a teacher training institution and completed its prescribed, rigorous, systematic and validated teacher education programs in the art and science of teaching their specialized subject(s) at a particular level of the educational system. A teacher, therefore, is someone who creates and influences desirable changes in the learner's behaviour to achieve the nation's educational goals and aspirations.

Teacher's role in curriculum implementation is very paramount because teachers are the interpreters and implementers of curriculum content. Teacher's knowledge about the content of the curriculum and the ability to effectively use the pedagogical skills determines the success of the curriculum implementation process. Students' failure in mathematics at secondary

school level has been attributed to many variables but teachers' variables seem to take the lead among all the variables identified by different scholars. (Salau, 2002, Adeniyi, 2012; Akanni, 2015; Akinoso, 2016; Ogunleye & Akinoso, 2016).

Teacher's role in curriculum implementation according to Fadairo and Olorisade (2002) include; A teacher should be an Innovator: - One of the teacher's role is to improve the curriculum to meet the needs of the society and that of the learner. He is to update his knowledge and ensures the maintenance of quality and high educational s standard. He is also expected to serve as the coordinator of educational activities as well as project into the future, to improve on the standard of education in the society; the dispenser of Knowledge: - A teacher is expected to be conversant with the skills of teaching and making relevant use of teaching materials. The Teacher is expected to have adequate knowledge of the subject(s) and at the same time possess the required pedagogical skills, a teacher is a facilitator of learning**:** - A teacher should be a resourceful person who has the capability of helping students to learn or gain knowledge. In this role, the teacher adopts a positive disposition toward the learners, the teacher considers the learners' interest, and experiences to influence desirable learning in the learners; and a Counsellor who is a teacher that has the responsibility of advising and helping students to develop their potentials. The teacher assists students in making personal adjustments, solves behaviour problems, advice on placement problems, and guides on occupational selection to guarantee a life of personal fulfilment.

If teachers performed their expected roles adequately, it is important to ask why most students fail to attempt more than half of the questions set for them, from the required curriculum content especially in external examinations. This is an indication that the process of teaching has been ineffectively handled. For instance, Jimoh (2003) discovered that an appreciable number of chemistry teachers in secondary school found some chemistry content difficult. He stressed further that questions on these teachers' perceived difficult concepts are found frequently in part II of WAEC questions which usually carry more marks than other parts. His findings also revealed that most students also had problems with most of the topics identified as difficult by teachers. while Odili, (2000); Adedayo, 2006 and Akanni (2015) discovered that secondary schools mathematics teachers find it difficult to solve problems on some selected topics from the senior secondary school syllabus.

According to Adeleke, (2007) and Oyedokun, (2002), a concept is said to be difficult for the teacher when the questions on the topics cannot be easily handled or solve by the teacher due to the nature or abstractness of the concept and such concept according to them demands extra effort to understand. Hence, it is necessary to know those topics that are identified as difficult topics by the teachers so that, necessary measures can be taken to enhance the teachers' understanding of such topics since students' performance depends greatly on the ability of the teachers to effectively carry out their duty.

Statement of the Problem

The issue of poor performance in Senior Secondary Mathematics in Nigeria has been a concern to both parents, teachers, and many stakeholders in Education. Many efforts have been put in place by the government to improve students' outcomes on the subject but the situation is still not impressive (Adeniyi, 2012 & Akanni 2015). Hence, it is important to know the areas teachers are finding difficult in the curriculum since success or failure of any educational process depend to a large extent on the teacher's ability to deliver.

Objectives of the Study

The purpose of the study was to find out those concepts identified by teachers as difficult concepts in a senior secondary school mathematics curriculum. Specifically, the study:

1. Found out those concepts in the senior secondary school mathematics curriculum identified as difficult by the teachers.
2. Ascertained the causes of the identified difficult mathematics concepts in the senior secondary school curriculum as perceived by the teachers.

Research Questions

The following research questions guided the study:

1. What mathematics concepts do teachers identified as difficult in the senior secondary school mathematics curriculum?
2. What are the factors responsible for making the identified concepts difficult?

Methodology

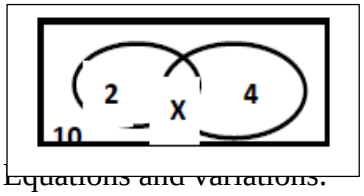
The study adopted a descriptive survey design and the instrument for data collection was a researcher designed questionnaire titled Difficult Concept Identification in Mathematics Questionnaire (DCIMQ). The items were based on the current national Mathematics curriculum for senior secondary. Section A of the questionnaire was on respondent bio-data while Section B measured the difficult Mathematics concepts as identified by teachers' and teachers' views on what made the identified concept difficult. Section B part I was made up of twenty-two 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 pilot tested using a school in Education District II and the reliability coefficient of 0.74 was obtained using Cronbach alpha.

The population of this study was all public senior secondary school teachers in Education District I &VI of Lagos State, Nigeria. The two districts were randomly selected from the six educational districts in Lagos State. Ten senior secondary schools were then selected randomly from each of the sampled districts, making a total of twenty schools. The sample size for the study consisted of one hundred and twenty (120) mathematics teachers teaching SSS2 and SSS3 who were selected purposefully from public senior secondary schools in Education District I & VI in Lagos State. The data collected were analyzed using descriptive statistics (of frequency count and mean).

Results

Research Question 1: What are the mathematics concepts identified by teachers as difficult concepts in the senior secondary school mathematics curriculum?

Table 1: Teachers' Perception of Difficult Concepts in the SSS Mathematics Curriculum

S/N	Topics	VD	D	LD	ND	Mean	Decision
1	Number Base System - Converting decimal fraction from other bases to base 10	10	8	28	74	1.37	ND
	Apply Number Base in Computer Programming	12	40	40	28	2.3	ND
2	Modular arithmetic - Simple or basic operations	8	16	40	56	1.67	ND
	Solving Problems in Standard Form	10	6	44	60	1.37	ND
	Problems involving the application of Laws of indices e.g. ax x ay = ax+y etc.	10	8	28	74	1.37	ND
3	Logarithms and Indices	12	8	40	60	1.33	ND
	Graphs of y = 10x	6	28	30	56	1.77	ND
	Using logarithm tables in to calculate powers and roots e.g. 214.3 x 3√308	10	8	40	62	1.47	ND
	solving problems on capital market (Application of logarithms)	52	42	10	16	2.53	D
4	Set theory - Identify types of set	4		40	76	1.43	ND
	Use of Venn diagram	4	12	36	68	1.60	ND
	Use Venn diagram to solve real-life problems - E.g. Find x? 	4	24	40	52	1.83	ND
5	Simple Equations and variations: - Problems involving inverse variation	4	4	60	52	1.67	ND
	Joint variation	24	12	44	44	1.73	ND
	Application of variation	56	40	14	10	2.87	ND
	Simple equations and variations	4	20	40	56	1.77	ND
	Simultaneous Equation		12	44	64	1.57	ND
	Quadratic equation:		24	32	64	1.67	ND
	Factorization of Quadratic Equation		16	40	64	1.60	ND
	One linear one quadratic simultaneous equation.	8	28	40	44	2.00	ND
	Forming Quadratic equations with known roots	4	12	40	64	1.63	ND
	Solve word problems in the Quadratic Equation.	40	48	12	20	2.52	D
6	Construction	4	40	40	36	2.10	ND

	- Bisection of lines and angles						
	Constructing angles	12	24	40	44	2.03	ND
	- Construction of equidistance point	36	42	12	30	2.52	D
	Locus of moving points	46	40	16	18	2.57	D
	Proofs of some Basic theorems	16	36	44	24	2.37	ND
7	Trigonometrical ratio	10	40	36	44	1.97	ND
	- Solve problems involving the use of sine and cosine formula.						
	Ratios of 30, 40 and 60	12	16	42	50	1.70	ND
	Solving problems using Trigonometrical Ratios	12	12	44	52	1.87	ND
	Solving problems on graphs of sine and cosine of angles.	16	36	28	40	2.23	ND
8	Mensuration.	40	44	12	24	2.53	D
	- Find the length of arc practically						
	Calculating perimeter of a circle and segments of circles	12	16	40	52	1.90	ND
	- Length of arcs using formula	10	12	46	52	1.67	ND
	- Area of a sector	4	22	30	64	1.53	ND
	Solving problems in the area of triangle and area of a circle.	4	16	52	48	1.80	ND
	Finding a connection between the surface area of a cone and sector of a circle.	15	28	41	36	1.93	ND
9	Statistics	24	24	32	40	1.67	ND
	- Construction of frequency distribution curve, histograms, bar chart and line graphs; pie chart						
	Frequency polygon (Ogive)	20	12	44	44	1.73	ND
10	Approximations	12	4	40	64	1.50	ND
	- Calculate percentage errors						
	Degree of accuracy	14	24	30	52	1.77	ND
11	Sequence and series	12	16	50	52	1.70	ND
	- Arithmetic progression						
	Geometric progression	10	12	54	44	1.73	ND
	Practical problems on AP and G.P	10	28	42	40	1.90	ND
12	Solving Quadratic and simultaneous equations using graphical method	10	26	28	56	1.83	ND
	Finding the gradient of a curve	52	28	36	4	2.53	D
	- Drawing tangents to a curve, at a given point.						
13	Graphs of Inequalities, and problems on inequalities.	10	32	34	44	1.90	ND
	- Linear inequalities in two variables						
	Finding maximum and minimum values of inequality graphs	28	48	40	8	2.52	D
	Introduction to linear programming	16	52	40	12	2.60	D
14	Mensuration II: Chord and angles in alternate segments.		28	52	40	1.90	ND
15	Circle theorems –Problems involving the application of circle theorems	48	50	4	18	3.07	D
16	Problem on sine and cosine rule.		28	64	28	2.00	ND

	the angle of elevation and depression.						
	Practical problems on bearings.	40	36	8	36	2.51	D
17	Measures of central tendency – mean, median, mode of ungrouped data.		12	76	32	1.83	ND
	Range, variance, standard deviation, practical application in capital market reports.						
	Areas of applications		28	56	36	1.93	ND
18	probability and practical application of probability	12	16	56	36	2.03	ND
19	Problems on Matrices and Determinants and Transpose of determinants	12	16	56	36	2.03	ND
	Solving simultaneous equations using determinants	4	48	28	40	2.13	ND
	Addition and multiplication of matrices	4	28	48	40	1.97	ND
20	Simple interest, compound interest, and arithmetic of finance	16	76	04	24	2.00	ND
		54	36	16	14	2.57	D
	Depreciation and rate of depreciation						
	Amortization	12	68	28	12	2.67	D
	- Problems in the capital market using logarithm table	12	56	36	16	2.53	D
21	Longitude and latitude	14	62	24	20	2.57	D
	- Problems on longitude and latitude						
	22 Co-ordinate geometry of straight lines	4	36	16	28	1.53	ND
	Distance between points	4	32	16	32	1.47	ND
	- Gradient and intercept of a straight line.	4	32	16	32	1.47	ND

Criterion, mean ≥ 2.5

From Table 1 above, it can be discovered that concepts such as application of Logarithms ($\bar{x}$: 2.53 > 2.50), word problem involving quadratic equations, ($\bar{x}$: 2.52 > 2.50), construction of equidistance from a point, ($\bar{x}$: 2.52 > 2.50), locus of moving point ($\bar{x}$: 2.60 > 2.57), Introduction to linear programming ($\bar{x}$: 2.60 > 2.50), Amortization ($\bar{x}$: 2.67 > 2.50), Problems on the capital market using logarithm table ($\bar{x}$: 2.53 > 2.50) were all identified as difficult concepts by the teachers.

Other concepts identified as difficult concepts by the teachers include; deducing maximum and minimum points ($\bar{x}$: 2.52 >2.50), calculating tangent to the circle ($\bar{x}$: 2.53 >2.50), circle theorem ($\bar{x}$: 2.67 >3.07), practical problems involving bearing, depreciation, and amortization ($\bar{x}$: 2.57 >2.50), problems on capital market ($\bar{x}$: 2.67 >2.50) and longitude and latitude ($\bar{x}$: 2.57 >2.50). The result in table 1 implies that teachers who identified a concept as a difficult concept are likely to deliberately skip teaching of the topic and where that is not the possible topic is likely to be chaotically taught.

Research Question 2: What are the factors responsible for the identified difficult concepts in the Nigerian SSS curriculum as perceived by the teachers?

Table 2: Factors responsible Identified Difficult Concepts in Secondary School Mathematics Curriculum

		SA	A	D	SD	Mean	Decision
1	Abstract nature of source concept.	40	64	12	4	3.17	Agree
2	Inadequate teachers' education curriculum.	20	40	56	4	2.63	Agree
3	Not linking mathematics concepts to a real-life situation.	36	56	24	4	3.03	Agree
4	Inadequate preparation of mathematics teachers	36	44	12	28	2.53	Agree
5	Predominantly use of discussion teaching method by teachers	4	48	44	24	2.07	Disagree
6	Some mathematics concepts are not interesting.	52	44	24	20	2.77	Agree
7	Insufficient problem-solving skill to handle some mathematics concepts	12	80	16	12	2.77	Agree
8	Irregular marking and correction of assignment to ascertain students' strengths and weaknesses in mathematics concepts.	24	4	40	52	2.20	Disagree
9	Teachers' background in the concept.	36	56	24	4	3.03	Agree
10	Lack of adequate training/refresher courses.	40	52	18	10	3.10	Agree

Criterion, mean ≥ 2.5

From table 2, teachers agreed on eight (8) out of ten (10) items identified as factors that can make mathematics concepts to be identified as difficult concepts by the teacher (mean ≥ 2.5).

Discussion of Findings

From the study, the teachers identified the following concept as difficult concepts in senior secondary school mathematics curriculum; problems related to the capital market, application of logarithms, construction of equidistance point, locus of moving points, proofs of some basic theorems, application of variation, word problems involving quadratic equation, problems on longitude and latitude, solving problems involving circle theorems, concepts of depreciation, amortization, linear programing and problems on the capital market using logarithm table. This finding corroborates that of Odili, (2000); Adedayo, (2006) and Akanni (2015) discovered that some mathematics teachers find it difficult to solve problems on some selected topics from the senior secondary school syllabus.

From the study, the teacher identified the following as the factors responsible for making the identified concept difficult; abstract nature of some mathematics concepts, inability to relate mathematics concepts to a real-life situation, inadequate teacher education curriculum, lack of adequate preparation by teachers, inadequate problem-solving skill to handle some mathematics concepts, teachers' derisory background in some concept and inadequate training/refresher courses for servicing teachers. This finding is in line with that of { Jimoh, (2003); Kolawole, & Oluwatayo, (2004); Aminu, (2005); Maliki, Ngban, & Ibu, (2009) & Adeleke, (2007)} who found that inadequate teacher education curriculum, inadequate

seminars/ workshop for teachers and teachers' inability to develop themselves to update their knowledge in their specialized areas constitute teachers' ineffectiveness in the classroom.

Conclusion and Recommendation

Based on the findings of the study, it can be concluded that mathematics teachers find some concepts difficult in the SSS curriculum. The study also, revealed that the teacher education curriculum is inadequate to produce teachers who can successfully handle all the topics/ concepts in the SSS mathematics curriculum.

Therefore, the study recommended that;

i. Teacher education curriculum should be overhauled to include revision of some concepts in the senior secondary school curriculum
ii. Teachers should be sensitized to make a personal effort to develop themselves adequately in their specialized subjects.
iii. School management/ ministry of Education should constantly organize workshop, training, and conferences for mathematics teachers to update their knowledge

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