Student and Teacher Perception of Content Difficulty in the Nigerian Senior Secondary Mathematics Curriculum

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Abstract

This study investigated the difficult contents in the Nigerian Senior Secondary Mathematics Curriculum (SSMC) as perceived by students and mathematics teachers in Akwa-Ibom State. The research study design was survey. The population consists of 89,561 senior secondary school students and 469 mathematics teachers drawn from 236 public secondary schools of the 31 local government areas of the State. A sample of 400 students and 216 mathematics teachers obtained from the population by Taro Yamane formula was used for the study. The relevant data were generated using the researcher designed instrument; Diagnosis and Remediation of Content Difficulty in the Senior Secondary Mathematics Curriculum (DRCDSSMC). The instrument has a reliability coefficient of 0.84 obtained by test-retest. The data gathered was analyzed using mean (Difficult; $\bar{x} \geq 2.5$ and Easy; $\bar{x} < 2.5$), standard deviation, simple percentage and independent sample t - test. Three research questions and one hypothesis guided the study. The hypothesis was tested at 0.05 significant level. The results obtained indicated that students and mathematics teachers perceived 33% and 14% of the SSMC content difficult respectively. Students perceived geometry and introductory calculus themes difficult to learn while the mathematics teachers perceived only introductory calculus difficult to teach. Also, there exists a significant difference between students and teachers perception of content difficulty in the SSMC. Recommendations were made accordingly.

Key words: *Student, Teacher, Perception, Difficulty, Mathematics Curriculum*

I. INTRODUCTION

The philosophy of Nigeria education is based on the belief that education is an instrument for national development, social change, promotion of a progressive and united nation, self-fulfilment and general development of the society. Education is therefore made compulsory and a right of every Nigerian irrespective of gender, social status, religion, colour, ethnic background and any peculiar individual challenges. This philosophy of education in Nigeria is based on the development of the individual into a sound and effective citizen and the provision of equal opportunities for all citizens of the nation at the basic, post basic and tertiary levels of education [1]. Post-basic education is the education that children obtain after a successful completion of ten years of basic education. It includes senior secondary education, higher school and continuing education given in vocational enterprise institutions as in [1]. General mathematics is one of the compulsory cross-cutting subject curricula of the senior secondary education curriculum.

The term curriculum has often been looked at as a vehicle through which the school strives toward the achievement of educational goals [2]. Curriculum is viewed as an instrument or a plan that guide instruction and provides criteria for evaluation in education. This also explains why the curriculum is described as an instrument par excellence in the educational process [3]. In recognition of this fact, the Federal Republic of Nigeria mandated the Nigerian Educational Research and Development Council (NERDC) to develop school curriculum for all levels of the educational system in Nigeria [4]. Curriculum from its Latin word currere or currus means racecourse or the relatively planned course work covered by learners in their race towards the finishing point for which awards are obtained. In the education sector, the awards could be certificates diplomas or degrees. [5] in [6] defined curriculum as an educational plan that spells out which goals and objectives should be achieved, which topics should be covered and which methods are to be used for learning, teaching and evaluation. This definition viewed curriculum as school teaching subjects through which basic skills and functional cultural heritage are transmitted to the learners. Basic mathematical skills are necessary skills that every individual should have in order to function and contribute positively to the development of the society.

Mathematics education curriculum is a booklet which shows an organized plan of learning experience in thematic approach consisting of topics, performance objectives, contents, teaching and learning activities, learning materials and evaluation. The senior secondary education mathematics curriculum in Nigeria has undergone several reviews since its first production in March 1978 [7]. The latest edition was revised in 2012. The new curriculum took into consideration the United Nations Millennium Developmental Goals (MDGs) and adopted the thematic approach. The curriculum has seven columns consisting of topics, performance objectives, content, teaching and learning activities, learning materials as well as evaluation. The contents of the old curriculum (1985 edition) was infused with elements of the capital market studies carefully structured, resulting in the removal of obsolete topics and addition of modern topics that are relevant to the global world, improve the mathematical competency of Nigeria children as well as prepare them for further and tertiary education. Such topics as investment, stocks, shares, modular arithmetic, rates, value added tax (VAT), depreciation, income tax (PAYE), monetary exchange, matrices and determinant, coordinate geometry and introductory calculus are modern topics included in the curriculum content. The themes have changed from the six-prolonged approach to a five-prolonged approach of number and numeration, algebraic processes, geometry, statistics and introductory calculus as in [4]. However, the objectives of the senior secondary mathematics education curriculum developed in line with the millennium development goals and in compliance with the National Economic Empowerment and Development Strategies (NEEDS) has not changed. However, following the changes in the contents of the senior secondary mathematics education curriculum and for the fact that this new curriculum has been implemented for the past six years, the study therefore investigates the students and teachers perception of the difficult contents in the senior secondary education mathematics curriculum.

A. Objectives of the Senior Secondary Education Mathematics Curriculum in Nigeria

The objectives of the senior secondary education mathematics curriculum are in line with the Millennium Development Goals (MDGs) and in compliance with the National Economic Empowerment and Development Strategies (NEEDS). Thus the objectives are summarized as;

1. To foster the desire and precision ability to a certain degree relevant to the problem at hand.
2. To develop and practice logical and abstract thinking.
3. To develop creativity skills.
4. To generate interest in mathematics and provide a solid foundation for everyday living.
5. To develop computational skills.
6. To provide necessary mathematical background for further education.
7. To develop ability to recognise problems and to solve them with related mathematical knowledge as in [7].

B. Statement of the Problem

Despite all the efforts at developing an acceptable general mathematics curriculum, students' performance in the subject appears to be declining over the years. This has been observed in the research findings of some scholars. The research finding of [8]) revealed that the content difficulty of Mathematics pervade all levels of education and also pose challenge to both teachers and students. When mathematics teachers who are suppose to be the pilot of Mathematics classroom delivery struggles to teach or skips the teaching of some mathematics topics, there is this implication of the students to exhibit a poor content knowledge of such topics. [9] has revealed that a high percentage of students do not attempt certain questions (such as problems on probability, word problems, circle theorems, geometrical construction, bearing) in mathematics and the few who attempt such questions exhibit weaknesses which make them obtain low scores. The same [9] also revealed that topics such as bodmas, inequalities, completing table of values, change of subject formula and construction of cumulative frequency tables were attempted by almost all the students. It will therefore not elude any stakeholder of mathematics education that there are some topics in the mathematics curriculum that teachers and students might perceive difficult.

It was reported by [10] that some of the characteristics of the difficult topics in the mathematics curriculum are inability of most students to understand, generation of anxiety on students, lengthy calculations, abstract nature of the topic and newly introduced topics into the mathematics curriculum. The afore mentioned scenario make it imperative to identify the difficult topics in senior school mathematics curriculum so that a further step can be taken to proffer solutions. Therefore this research piece is poised to investigate the difficult content areas in the Nigerian senior secondary education mathematics curriculum as perceived by teachers and students.

C. Purpose of the Study

The purpose of this study is to identify difficult contents in the senior secondary mathematics curriculum as perceived by students and teachers. Specifically, the study shall;

1. Identify contents in the Senior Secondary Mathematics Curriculum (SSMC) that students and teachers perceive difficult.
2. Determine the student and teacher percentage perception of difficult contents in the SSMC.

D. Research Questions

1. What contents in the Senior Secondary Mathematics Curriculum (SSMC) do students and teachers perceive difficult?
2. What is the student and teacher percentage perception of difficult contents in the SSMC?

E. Hypothesis

1. There is no significant difference between student and teacher perception of the difficult contents in the senior secondary mathematics education curriculum.

II. METHODS AND MATERIALS

The study adopted a survey research design. The population of the study consists of 89,561 senior secondary students and 469 mathematics teachers from the 236 public secondary schools of the 31 Local Government Areas of Akwa-Ibom State (PRS Dept; SSEB, Uyo, 2017). A sample of 400 senior secondary class three students and 216 mathematics teachers obtained from the population by Taro Yamane formula was selected by simple random sampling and used for the study. Diagnosis and Remediation of Difficult Contents in Senior Secondary Mathematics Curriculum (DRDCSSMC) was the instrument for data collection. DRDCSSMC was a researcher made questionnaire divided into two sections. Section A measured demographic data while Section B was patterned after the 4-point Likert scale of Very Difficult (VD)-4 points, Difficult (D) -3 points, Easy (E) – 2 points and Very Easy (VE)- 1 point. The face and content validity of DRDCSSMC were ascertained by three experts in the area of mathematics education. From their inputs, necessary corrections and modifications were made to arrive at a valid instrument. The test-retest method was used to ascertain the reliability of DRDCSSMC using fifty (50) senior secondary class three students in public secondary schools that were not part of the study. DRDCSSMC was administered to the 50 students and re-administered to the same students after two weeks. The data collected was analysed using Spearman correlation coefficient and a reliability coefficient of 0.84 was obtained.

DRDCSSMC was administered to the respondents in the respective public secondary schools by the researchers with the assistant of the mathematics teachers. DRDCSSMC had two parts namely; part A which is concerned with the demographic data of the respondents, part B consist of questions presented in form of series of statements drawn from all the contents of the senior secondary mathematics curriculum which covers the five prolonged themes of Number and Numeration, Algebraic Processes, Geometry, Statistics and Introductory Calculus. The instrument was administered to students in the respective schools at different time and day for easy administration and retrieval. The mean, simple percentage and standard deviation were used to answer the research questions. Content with mean ($\bar{x} \geq 2.5$) is difficult while content with mean ($\bar{x} < 2.5$) is not difficult. The Independent sample t-test was used to test the hypothesis at 0.05 significant level.

III. RESULT

Research Question 1: What contents in the Senior Secondary Mathematics Curriculum (SSEC) do students and teachers perceive difficult?

Table 1a: Mean and standard deviation on number and numeration curriculum content difficult with students and teachers.

		Student, N=400		Teacher, N=216	
S/N	Number and Numeration	Mean	SD	Mean	SD
1	Number bases system	1.95	1.03	1.71	1.43
2	Conversion from one base to base 10	1.93	1.05	1.93	1.32
3	Conversion of decimal fraction in one base to base 10	1.99	1.00	1.76	1.33
4	Conversion of number from one base to another base	1.98	1.01	1.87	1.41
5	Addition, subtraction, multiplication and division of number bases	2.00	1.98	1.92	1.30
6	Application to computer programming	**2.65**	**0.83**	1.94	1.31
7	Modular Arithmetic	1.96	1.02	1.79	1.44
8	Concept of module arithmetic	1.98	1.11	1.59	1.55
9	Addition, subtraction and multiplication operations in module arithmetic	**3.15**	**0.45**	1.87	1.42
10	Application to daily life	1.97	1.10	1.85	1.35

11	Indices	1.99	1.01	1.82	1.34
12	Laws of indices	2.03	0.97	1.95	1.33
13	Application of indices, simple indicial equations	1.87	1.07	1.64	1.43
14	Logarithms	1.91	1.02	1.83	1.32
15	Deducing logarithm from indices and standard form	1.98	0.99	1.86	1.33
16	Definition of logarithm	1.94	0.98	1.93	1.41
17	Graph $y = 10^x$	1.92	1.21	1.88	1.30
18	Reading of logarithm and antilogarithm tables	1.97	1.04	1.67	1.31
19	Use of logarithm in calculation, division, powers and roots	**2.67**	**0.89**	1.59	1.44
20	Application of logarithm in capital market and other real life problems	**2.51**	**0.92**	1.72	1.55
21	Logarithm of numbers greater than 1	1.97	1.03	1.92	1.42
22	Comparison of characteristics of logarithms and standard form of numbers	1.94	1.05	1.95	1.35
23	Logarithm of numbers less than 1 including multiplication, division, power and roots	1.99	1.00	1.73	1.43
24	Solution of simple logarithms equations	1.95	1.01	1.77	1.32
25	Sets	1.96	1.98	1.89	1.33
26	Definition of set	2.03	0.83	1.78	1.41
27	Set notation	2.01	1.02	1.84	1.3
28	Types of sets: employ set, infinite, universal sets	1.98	1.11	1.94	1.31
29	Set operations; union, intersection, complement	1.96	0.45	1.73	1.44
30	Venn diagram and application up 3 set problem	**3.17**	**0.40**	1.57	1.55
31	Approximation and application to everyday life	**2.55**	**1.01**	1.54	1.42
32	Percentage error	2.00	0.97	1.57	1.35
33	Sequence and series	1.85	1.07	1.65	1.34
34	Meaning and types of series	1.93	1.02	1.73	1.33
35	Arithmetic progression (AP); calculation of first term, common difference, nth term arithmetic mean sum of an A.P etc.	**2.61**	**0.99**	1.65	1.34
36	Geometric progression (GP); calculation of first term, common ratio, nth term, geometric sum of terms of infinity etc.	**2.54**	**0.98**	1.73	1.33
37	Surds	**3.15**	**0.71**	1.76	1.43
38	Meaning of rationale and irrational numbers leading of the definition of surds	1.98	1.04	1.74	1.32
39	The rules guiding the basic operation with surds	1.99	0.89	1.76	1.33
40	Conjugate of bionomical surds using the idea of difference to two squares	1.94	0.92	1.65	1.41
41	Application of solving triangles of involving trigonometric ratios of special angles, 30^0, 60^0, and 45^0	1.97	1.03	1.56	1.3
42	Evaluation of expressions involving surds	**3.16**	**0.65**	1.60	1.31
43	Matrices and determinants	2.06	1.00	1.56	1.43
44	Definition, order and notation of a matrix	2.08	1.01	1.74	1.32
45	Types of matrices	1.94	1.98	1.86	1.33
46	Addition and subtraction of matrices	1.99	0.83	1.67	1.41
47	Scalar multiplication of matrices	1.93	1.02	1.64	1.30
48	Transpose of a matrix	1.99	1.11	1.67	1.31
49	Determinant of $2 x 2$ and $2 x 3$ matrices	2.04	0.45	1.55	1.44

50	Single interest	1.96	1.10	1.53	1.55
51	Compound interest	1.99	1.01	1.83	1.42
52	Depreciation	2.04	0.97	1.56	1.35
53	Annuities	2.04	1.07	1.58	1.34
54	Amortization	1.96	1.02	1.67	1.33
55	Further use of logarithm table in problems involving, bonds and debentures, shares	1.87	0.99	1.66	1.44
56	Rates, income tax (PAYE) and value added tax (VAT)	**3.19**	**0.38**	1.70	1.55
57	Number and numeration	2.06	1.21	1.67	1.41
	Grand mean	**2.14**	**0.88**	**1.74**	**1.38**

Key: *Difficult ($\bar{x} \geq 2.5$***), Easy (*** $\bar{x} < 2.5$***)***

Table 1a showed that the mean and standard deviation on number and numeration curriculum content difficult with students and teachers were M= 2.14, SD= 0.88 and M= 1.74, SD= 1.38 respectively. The highest number and numeration curriculum content difficult with the students was Rates, income tax (PAYE) and value added tax (VAT) (M= 3.19, SD= 0.38) while there was no number and numeration curriculum content difficult with the teachers and the least difficult for students was application of logarithm in capital market and other real life problems (M= 2.51, SD= 0.92).

Table 1b: Mean and standard deviation on algebraic process curriculum content difficult with students and teachers

		Students, N=400		**Teachers, N= 216**	
S/N	**Algebraic Processes**	**Mean**	**SD**	**Mean**	**SD**
58	Simple equations and variations	2.04	1.24	1.77	1.41
59	Change of subject of formula involving brackets, roots and powers	2.08	1.21	1.51	1.30
60	Subject of formula and substitution	2.06	1.23	1.79	1.31
61	Types of variation. Direct, inverse, joint, and partial	1.98	1.32	1.81	1.43
62	Application of variation	1.95	1.00	1.79	1.32
63	Quadratic equation	2.03	0.98	1.75	1.33
64	Factorization of quadratic expressions	2.05	0.99	1.79	1.41
65	Solution of quadratic equation of the form $ab = 0$,	2.02	1.01	1.78	1.30
66	Formation of quadratic equation with given roots	2.01	1.01	1.77	1.34
67	Drawing quadratic graph and obtaining roots from a quadratic graph	2.04	1.02	1.89	1.31
68	Application of quadratic equation to real life situations	1.96	1.41	1.74	1.44
69	Logical reasoning	**3.17**	**0.47**	1.69	1.55
70	Simple interest	1.93	1.25	1.88	1.42
71	Meaning of simple statement; true or false	1.96	1.21	1.77	1.35
72	Negation of simple statement	2.06	0.98	1.66	1.34
73	Compound statement; meaning, conjunction disjunction, implication and bi-implication	1.98	1.22	1.69	1.33
74	Logical operators and symbols, list of logical operators and symbols and construction of truth table chart for each of the five logical operations.	**3.11**	**0.56**	**2.63**	**0.55**
75	Application of linear and quadratic equations to capital market etc.	2.08	0.98	1.82	1.55

76	Simultaneous linear quadratic equations	2.01	1.00	1.88	1.41
77	Word problems on linear equation, simultaneous linear equation, quadratic equations; one linear one quadratic	**3.08**	**0.66**	1.75	1.41
78	Application to capital market	1.94	1.30	1.56	1.30
79	Straight line graphs	1.91	1.24	1.88	1.31
80	Gradient of straight line	1.95	1.21	1.87	1.43
81	Drawing of tangent to a curve	1.94	1.23	1.79	1.32
82	Simple and compound statement	1.97	1.32	1.74	1.33
83	Logical operations and the truth table	**3.18**	**0.43**	1.77	1.41
84	Conditional statements and indirect proofs	**3.06**	**0.63**	2.65	1.30
85	Gradient of a curve	2.02	0.99	1.81	1.31
86	Linear inequalities in one variable	2.01	1.01	1.86	1.44
87	Solutions of inequalities in two variables	**2.50**	**1.01**	1.91	1.55
88	Range of values of combined inequalities	**2.55**	**1.02**	1.69	1.42
89	Graph of linear inequalities in two variables	**2.61**	**1.41**	1.75	1.35
90	Maximum and minimum values of simultaneous linear inequalities	2.02	0.43	1.79	1.34
91	Application of linear inequalities in real life	1.99	1.25	1.92	1.33
92	Introduction of linear programming	**3.12**	**0.71**	**2.64**	**0.54**
93	Simplification of fractions	1.89	0.98	1.75	1.41
94	Operation in algebraic fractions	1.91	1.22	1.73	1.30
95	Equation involving fractions	1.88	0.56	1.77	1.31
96	Substitution in fraction	1.94	0.98	1.83	1.43
97	Simultaneous equation involving fraction	1.99	1.00	1.84	1.32
98	Undefined value of a fraction	2.02	1.04	1.69	1.33
99	Algebraic processes	**2.51**	**1.30**	1.75	1.35
	Grand mean	**2.16**	**0.97**	**1.84**	**1.33**

Table 1b showed that the mean and standard deviation on algebraic processes curriculum content difficult with students and teachers were 2.16, SD= 0.97 and 1.84, SD= 1.33 respectively. The highest algebraic processes curriculum content difficult with students was logical table operations and the truth table (M= 3.18, SD= 0.43) and that for teachers was introduction of linear programming (M=2.64, SD= 0.54). The least for students and teachers were solutions of inequalities in two variables (M= 2.50, SD= 1.01) and logical operators and symbols, list of logical operators and symbols and construction of truth table chart for each of the five logical operations (M= 2.63, SD= 0.55) respectively.

Table 1c: Mean and standard deviation on geometry curriculum content difficult with students and teachers

		Students, N= 400		Teachers, N= 216	
S/N	**Geometry**	**Mean**	**SD**	**Mean**	**SD**
100	Construction of triangle with given sides and bisection of an angle; 30^0, 45^0, 60^0 and 90^0	2.12	1.01	1.89	1.20
101	Construction of; angle equal to a given angle, and 4-sided	2.15	1.02	2.44	1.14

	plane figures given certain conditions				
102	Construction of locus of moving points equidistance from 2 lines, 2 points and constant distance from a point, etc.	**3.94**	**0.33**	**2.53**	**0.99**
103	Proofs of; angle sum of a triangle is 180^0	**2.51**	**0.43**	**2.51**	**1.00**
104	The exterior angle of a triangle is equal to the sum of two interior opposite angles	2.17	1.25	2.34	1.32
105	Angles of parallel lines, angles in a polygon congruent triangle.	1.98	1.21	1.81	1.34
106	Properties of parallelogram	1.91	0.98	1.90	1.25
107	Intercept theorem	**3.04**	**0.53**	**2.67**	**0.85**
108	Circle theorem, angle subtended by chords in a circle at the centre	**2.61**	**0.56**	**2.52**	**1.01**
109	Perpendicular bisectors of chords	**2.73**	**0.98**	**2.60**	**0.87**
110	Angles in alternate segments	**2.64**	**1.00**	**2.60**	**0.87**
111	Proof of; angle which are subtends at the centre is twice the angle it subtends at the circumference of a circle.	**2.71**	**0.66**	**2.66**	**0.89**
112	Proof of angles in the same segments of a circle are equal	**2.53**	**1.30**	**2.50**	**1.05**
113	Proof of; angle in a semi-circle	**3.09**	**0.62**	**2.98**	**0.66**
114	Cyclic quadrilaterals, tangents to a circle	**3.04**	**0.71**	**2.88**	**0.71**
115	Earth as a sphere; identification of north and south poles; longitudes and latitudes, small circles and great circles, meridian and equator	2.05	1.23	2.43	1.13
116	Calculation of; distances along the parallel of latitude, radius of parallel of latitude. Radius of the earth etc.	**2.89**	**1.32**	**2.88**	**0.73**
117	Geometry	**2.53**	**1.47**	2.01	1.36
118	The Cartesian rectangular coordinates	1.95	0.63	1.93	1.20
119	Plotting the linear graph	2.09	0.99	2.01	1.14
120	Distance between two coordinate points	**3.08**	**0.63**	**2.77**	**0.99**
121	Midpoint of line joining two points	**3.03**	**1.01**	**2.78**	**1.00**
122	Practical application of coordinate geometry	**2.96**	**1.02**	**2.80**	**1.32**
123	Gradients and intercept of a straight line	2.06	1.41	2.35	1.34
124	Determination of equation of a straight line	2.12	0.43	2.48	1.25
125	Angle between two intersecting straight lines	1.94	1.01	2.38	0.85
126	Application of linear graphs to real life situations	**2.94**	**1.02**	2.77	1.01
127	Coordinate geometry	2.06	0.33	**2.88**	**0.87**
128	Basic trigonometric ratios of; cosine, tangent with respect to right angle triangle	2.35	0.43	1.67	0.87
129	Trigonometric ratios related to the unit circle	2.33	1.25	1.83	0.89
130	Application of trigonometric rations of special angles to simple problems	2.34	1.21	1.91	0.95
131	Trigonometric ratios related to the unit circle	2.31	0.98	1.69	1.36
132	Graphs of sines and cosines	2.33	0.53	1.76	0.71
133	Derivation of sine rule	**2.94**	**0.56**	1.77	1.13
134	Derivation and application of cosine rule	2.12	0.98	1.73	0.73
135	Bearing	**3.10**	**0.65**	1.80	1.36
136	Angles of elevation and depression	**2.95**	**0.66**	1.69	1.45
137	Definition and drawing of; 4 cardinal points	2.21	1.30	1.69	1.20
138	Notation for bearings; cardinal nations e.g. N30^0E, S45^0W 3-digits notations e.g. 075^0; etc.	**2.52**	**1.24**	1.89	1.14

139	Practical problems and bearings	**2.62**	**1.21**	1.87	0.99
140	Graphs of sine $0 \leq x \leq 360^0$ and cosine $0 \leq x \leq 360^0$	**2.76**	**1.23**	1.67	1.00
141	Graphical solution of simultaneous linear and trigonometric equations	**2.59**	**1.32**	1.69	1.32
142	Trigonometry	2.21	0.47	1.77	1.34
143	Length of areas of circle	2.31	0.63	1.80	1.25
144	Perimeter of sectors and segments	2.3	0.99	1.85	0.85
145	Areas of sectors and segments of a circle	2.33	1.01	1.88	1.01
146	Relation between the sector of a circle and the surface area of a cone	2.43	1.01	1.59	0.87
147	Surface area and volume of solids cube, cuboids, cylinder, cone, prisms and pyramids	2.28	1.02	1.68	0.87
148	Surface areas and volume of frustum of a cone and pyramid	**2.50**	**1.41**	1.89	0.89
149	Surface area and volume of compound shapes	**2.78**	**0.43**	1.81	0.95
150	Surface area and volume of a sphere	2.43	0.98	1.85	0.66
151	Mensuration	2.21	0.99	1.79	0.71
	Grand mean	**2.50**	**0.69**	**2.15**	**1.03**

Key: Difficult ($\bar{x} \geq 2.5$), Easy ($\bar{x} < 2.5$)

Table 1c showed that the mean and standard deviation on geometry curriculum content difficult with students and teachers were M= *2.50*, SD= *0.69* and M= *2.15*, SD= *1.03* respectively. The highest geometry curriculum content difficult with the students was Construction of locus of moving points equidistance from 2 lines, 2 points and constant distance from a point, etc. (M= *3.15*, SD= *0.29*) and geometry (M= *3.94*, SD= *0.33*) while that for teachers was proofs of; angle sum of a triangle is 180^0 (M= *2.98*, SD= *0,66*). The least for students was Surface areas and volume of frustum of a cone and pyramid (M= *2.50*, SD= *1.41*) while that for teachers was proof of angles in the same segments of a circle are equal (M= *2.50*, SD= *1.05*).

Table 1d: Mean and standard deviation on Statistics curriculum content difficult with students and teachers

		Students, N= 400		Teachers, N= 216	
S/N	**Statistics**	**Mean**	**SD**	**Mean**	**SD**
152	Collection, tabulation and presentation of data	2.02	1.01	1.79	1.21
153	Frequency distribution	1.91	1.02	1.62	1.34
154	Linear graph, bar graph and histograms	1.9	1.41	1.78	1.30
155	Pie chart	2.04	0.43	1.64	1.42
156	Frequency polygon	1.95	1.01	1.79	1.21
157	Meaning and computations of mean, median, mode of ungrouped data	1.92	1.02	1.77	1.32
158	Definitions of range, variance, standard deviation	2.07	0.99	1.90	1.00
159	Calculation of range, variance and standard deviation	**2.65**	**0.66**	1.86	1.11
160	Practical application in capital market reports; home, health studies, population studies.	**2.61**	**1.25**	1.74	1.25
161	Need for grouping: calculation of class boundaries, class intervals, class mark	1.88	1.21	1.68	1.40
162	Calculation of cumulative frequencies and drawing of cumulative frequency curve graph (Ogive)	**2.60**	**1.01**	1.74	1.25
163	Using graph of cumulative frequencies to estimate; median, quartiles, percentiles and other relevant	**2.60**	**1.02**	1.68	1.40

	estimates				
164	Application of ogive to everyday life	**2.52**	**1.41**	**2.52**	**0.78**
165	Determination of the mean, median, and mode of grouped frequency data	1.99	0.43	1.61	1.46
166	Statistics	**2.61**	**1.01**	1.82	1.13
167	Definitions and examples of; experimental outcomes, random experiment, sample space, sample point, event space and probability	2.53	0.89	1.87	1.20
168	Chance instrument; dice, coin, park of playing cards	**2.50**	**1.02**	1.94	1..01
169	Theoretical probability and limiting values of relative frequencies	**2.95**	**0.54**	**2.71**	**0.67**
170	Equiprobable sample space; definition and unbiasedness	2.73	1.02	1.89	1.21
171	Simple probable on equiprobable sample space	2.64	0.99	1.83	1.34
172	Addition and multiplication rules of probability, mutually exclusive event and addition “or” rule complementary events and probability rule	2.01	0.66	1.71	1.30
173	Complimentary events and probability rule	2.05	1.25	1.68	1.42
174	Independent events and multiplication “and” rules	2.27	1.21	1.64	1.21
175	Solving simple problems on mutually exclusive, independent and complementary events	**2.85**	**0.73**	1.61	1.32
176	Experiment with or without replacement	**2.82**	**0.79**	1.89	1.21
177	Practical application of probability	2.52	0.87	**2.50**	**0.73**
178	Probability	2.05	1.15	1.91	1.11
	Grand mean	**2.34**	**1.01**	**1.86**	**1.15**

Key: *Difficult ($\bar{x} \geq 2.5$***), Easy (*** $\bar{x} < 2.5$***)***

Table 1d showed that the mean and standard deviation on statistics curriculum content difficult with students and teachers were M= *2.34*, SD= *1.01* and M= *1.86*, SD= *1.15* respectively. The highest statistics curriculum content difficult with students and teachers was theoretical probability and limiting values of relative frequencies (M= *2.95*, SD= *0.54*) and (M= *2.71*, SD= *0.67*) respectively. The least statistics curriculum content difficult with students was chance instrument; dice, coin, park of playing cards (M = *2.50*, SD= *1.02*) while that for teachers was practical application of probability (M= *2.50*, SD= *0.73*).

Table 1e: Mean and standard deviation on introductory calculus curriculum content difficult with students and teachers

		Students, N= 400		**Teachers, N= 216**	
S/N	**Introductory Calculus**	**Mean**	**SD**	**Mean**	**SD**
179	Meaning of differentiation/derive function	1.89	1.25	1.88	1.23
180	Differentiation from the first principle	1.98	1.21	2.37	1.01
181	Standard derivations of some basic function	2.07	1.01	2.39	0.99
182	Rules of differentiation such as sum and difference, product rule and quotient rule	1.99	1.02	2.13	1.22
183	Application to real life situation such as maxima and minima, velocity, acceleration and rate of change	**2.95**	**0.87**	**2.64**	**0.68**
184	Differentiation of algebraic function	**2.97**	**0.68**	**2.80**	**0.46**
185	Integration and evaluation of definite simple algebraic functions	**2.99**	**0.62**	**2.70**	**0.59**

186	Application of integration in calculating area under the curve	**2.91**	**0.72**	**2.89**	**0.46**
187	Use of Simpson's rules to find area under curve	**3.05**	**0.49**	**2.81**	**0.43**
188	Integration	**3.01**	**0.49**	**2.81**	**0.43**
	Grand mean	**2.53**	**0.79**	**2.50**	**0.83**

Key: *Difficult ($\bar{x} \geq 2.5$***), Easy (*** $\bar{x} < 2.5$***)***

Table 1e showed that the mean and standard deviation on introductory calculus curriculum content difficult with students and teachers were *2.53*, SD= *0.79* and *2.50*, SD= *0.83* respectively. It showed that the highest introductory calculus curriculum content difficult with the students was use of Simpson's rule to find area under curve and integration (M= *3.05*, SD= *0.49*) while that for teachers was application of integration in calculating area under the curve (M= *2.89*, SD= *0.46*). The least for students was application of integration in calculating area under the curve (M= *2.91*, SD= *0.72*) while that for teachers was application to real life situation such as maxima and minima, velocity, acceleration and rate of change (M= *2.64*, SD= *0.68*).

Research Question 2. What is the student and teacher percentage perception of difficult contents in the SSMC?

Table 2: Percentage perception of students and teachers on senior secondary mathematics curriculum content difficulty.

			Students		Teachers	
S/N	**Curriculum Content**	**N**	**Difficult**	**Easy**	**Difficult**	**Easy**
1	Number and Numeration	57	11(19%)	46(81%)	0(0%)	57(100%)
2	Algebraic Process	42	10(24%)	32(76%)	2(5%)	40(95%)
3	Geometry	52	25(48%)	27(52%)	15(29%)	37(71%)
4	Statistics	27	10(37%)	17(63%)	3(11%)	24(89%)
5	Introductory calculus	10	6(60%)	4(40%)	6(60%)	4(40%)
	Total	**188**	**62(33%)**	**126(67%)**	**26(14%)**	**162(86%)**

Table 2 showed the percentage perception of students and teachers on senior secondary mathematics curriculum content difficulty. It shows that number and numeration was difficult for *11*(*19%*) students while it was not difficult for any teacher. Algebraic process was difficult for *10*(*24%*) students while *2*(*5%*) had it difficult. It also showed that geometry was difficult for *25*(*48%*) students and *15*(*29%*) teachers. It again showed that statistics was difficult for *10*(*37%*) students and *3*(*11%*) teachers. It further showed that introductory calculus was difficult for *6*(*60%*) students and *6*(*60%*) teachers. The table also showed generally that students and teachers perceived *33%* and *14%* of the senior secondary education mathematics curriculum content difficult respectively.

A. Research Hypothesis:

H_{01}: There is no significant difference between students and teachers perception of the difficult contents in the senior secondary mathematics curriculum.

Table 3: Mean, standard deviation and independent sample t-test on the difference between students and teachers perception of the difficult contents in the senior secondary mathematics curriculum.

Respondent	**N**	**Mean**	**SD**	**t**	**p-value**
				8.96	0.00
Student	188	2.30	0.42		
Teacher	188	1.94	0.36		

Table 3 showed the mean, standard deviation and independent sample t-test on the difference between students and teachers perception of the difficult contents in the senior secondary mathematics curriculum were *2.30*, SD=*0.42* and *1.94*, SD= *0.36* for students and teachers respectively. The result showed that there is a significant difference between students and teachers perception of the difficult contents in the senior secondary education mathematics curriculum ($t = 8.96, p < .05$). The null hypothesis was rejected at *0.05* alpha level.

B. Discussion of findings

1. The difference between students and teachers perception of the difficult contents in the senior secondary mathematics curriculum

Findings from this work established that there is a significant difference between students and teachers perception of the difficult contents in the Senior Secondary Mathematics Curriculum ($t = 8.96, p < .05$). The null hypothesis was rejected at *0.05* alpha level. This finding implied that the students and teachers had a different level of perceived difficulty of the contents in the senior secondary mathematics curriculum as the students tends to have more difficulty in dealing with the curriculum contents than the teachers. This finding is consistent with the views of [11] and [12] as cited in 13 who reported that most students have learning difficulty and that the method of instruction can influence the performances of students with low achievement in mathematics.

2. Contents of the senior secondary mathematics curriculum difficult with students and mathematics teachers.

Findings from the study showed that out of the five themes of the senior secondary mathematics curriculum, geometry (M= 2.50, SD= 0.69) and introductory calculus (M= 2.53, SD= 0.79) were difficult with students while only introductory calculus (M= 2.50, SD= 0.83) was difficult with mathematics teachers. This result supports the reports of [14] that geometry was difficult with students to learn and [15] that differential and integral calculus were difficult with teachers to teach.

3. Students and Teachers Percentage Perception of Difficult Contents in the SSMC

Findings from this study revealed that students and teachers perceived *33%* and *14%* of the contents of the senior secondary education mathematics curriculum difficult respectively while *13%* of the contents were commonly perceived difficult by students and teachers. Earlier finding by [16] as cited in 13 revealed that more than *30%* of students in schools today have significant difficulties learning mathematics in spite of normal intelligence. This percentage of students perceived more than *30%* of the mathematics curriculum content difficult to learn.

4. Recommendations

The following recommendations were made based on the findings of this study:

- The senior secondary education mathematics curriculum contents of Geometry and Introductory Calculus should be reviewed by the Nigerian Educational Research and Development Council (NERDC).
- Team teaching and practical instruction in mathematics education should be encouraged in senior secondary mathematics instructional practice.
- Professional bodies and institutions like the Mathematical Association of Nigeria (MAN), Science Teachers Association of Nigeria (STAN) and the National Mathematical Centre (NMC) should organize regular workshops on the difficult contents of the senior secondary mathematics curriculum especially on the themes of Geometry and Introductory Calculus for trainee and in-service mathematics teachers.

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