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Identifying mathematics themes perceived difficult by secondary school students

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ABSTRACT
This paper examines the 'O' level mathematics themes specifically to identify the most difficult content areas in order to improve students' achievement in mathematics. In this study, questionnaire made up of the content areas in 'O' level mathematics were administered in classrooms using random sample technique. The sample consists of 214 students; 102 males and 112 females of some selected Secondary schools in Nasarawa State. The respondents are all SS III students of 2012/2013 academic session. The data collected was analysed using simple arithmetic percentages. It was established that a great number of the respondents perceived Plane Geometry as the most difficult content area in "O" level mathematics and this constitute 80 (37.4%) of the 214 respondents. This is followed by 55 (25.7%) of the respondents who are of the view that Algebraic Processes is the most difficult.

Introduction

In improving students' achievement in mathematics, the factors responsible for the poor performance of students must be recognized and investigated. Aremu and Sokan (2003) submitted that the search for the cause of poor academic achievement in mathematics is unending. Some of the factors identified by them are motivational orientation, self-esteem /self efficacy, emotional problems, study habits, teacher consultation and poor interpersonal relationships among students. Also, mathematics educators such as Ali (1986),Obioma and Ohuche (1986) and Ale (1989) have identified several factors as being responsible for the poor achievement in mathematics by secondary school students.

In this study we examine the 'O' level mathematics content areas with the view to identifying content areas that are most difficult. The design adopted for this study is descriptive survey.

Research Question

The following research questions are raised for the study.

(a) Is the theme well taught?
(b) Is the theme interesting?
(c) Are there adequate teaching aids?

Methodology

Sample

The sample for this study consists of 214 students of SS III made up of 102 males and 112 females in the 2012/2013 academic session. The samples were selected using random sample techniques from seven Secondary schools namely Government Secondary School, Uke (42 questionnaires), Government Secondary School, Gidan Zakara (8 questionnaires), Government Secondary School, Yelwa-Keffi (51 questionnaires), Government Secondary School,Marmara (35 questionnaires), Government Secondary School, Laminga (4 questionnaires),Federal Government College, Keffi, (51 questionnaires) and Al-Iman secondary school, Keffi, (23 questionnaires). The schools are located in Karu, Keffi and Nasarawa Local Government Areas of Nasarawa State, Nigeria.

Research Instrument

The instrument for this study is a self – administered questionnaire made up of two sections. Section one contains the content areas of O' level mathematics with response scale; very easy, easy, very difficult, difficult or never taught. Section two contains the research questions on respondent opinion in their choice of alternative options. For confidentiality the name of the respondent was omitted in the questionnaire.

Analysis of Data

We analysed the data collected by using simple arithmetic percentages.

Result

Table 1 shows that 22 (10.3%) of the respondents are of the view that Number and Numeration is the most difficult content area while 55 (25.7%) consider Algebraic Processes as the most difficult. The numbers of respondents that believe Mensuration is the most difficult are 47 (22%) 80 (37.4%) respondents said Plane Geometry is the most difficult and 53 (24.8%) believe Trigonometry is the most difficult. 29 (13.6%) of the respondents are of the opinion that Statistics and Probability is the most difficult content area in 'O' level mathematics.

Table shows that a large number of the respondents are of the opinion that Plane Geometry and Algebraic Processes are neither well taught nor interesting. Of the 214 respondents 133 (62%) said Plane Geometry is not well taught, 113 (53%) said it is not interesting and 136 (64%) said there are no adequate teaching aids. In the case of Algebraic Processes, 125 (58%), 137 (64%) and 180 (70%) of the respondents said the content area is not well taught, not interesting and no adequate teaching aids respectively.

Recommendations

(i) Instructors/learners should carry out a lot construction activities while teaching/learning Plane Geometry.
(ii) Difficult concepts in Algebraic Processes should be simplified with meaningful examples or Illustrations
(iii) Adequate teaching aids should be provided when teaching concepts that require its usage.

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Table 1 : Distribution of students by sex according to perceived difficulty of content areas in 'O' level mathematics

CONTENT AREAS	RESPONSE	SEX					
A. NUMBER AND NUMERATION		MALE	FEMALE	TOTAL	MALE %	FEMALE %	TOTAL %
Number bases, Fraction, decimals and approximations, Indices, Logarithms, Sequence, Sets, Positive and Negative integers, Rational numbers, Surds, Ratio, Proportion and rates, Variation, Percentages.	Very easy	23	26	49	10.7	12.1	22.9
	Easy	64	74	138	29.9	34.6	64.5
	Very difficult	7	2	9	3.3	0.9	4.2
	Difficult	5	8	13	2.3	3.7	6.1
	Never taught	3	2	5	1.4	0.9	2.3
		102	112	214	47.6	52.2	100
B. ALGEBRAIC PROCESSES **Algebraic expressions, Simple operations on algebraic expressions, Solution of linear equations, Change of subject of a formula/relation, Quadratic equations, Graphs of linear and quadratic functions, linear inequalities, Algebraic fractions.**	Very easy	23	14	37	10.7	6.5	17.3
	Easy	54	55	109	25.2	25.7	50.9
	Very difficult	8	10	18	3.7	4.7	8.4
	Difficult	13	24	37	6.1	11.2	17.3
	Never taught	4	9	13	1.9	4.2	6.1
		102	112	214	47.6	52.3	100
C. MENSURATION **Length and Perimeters, Areas, Volumes.**	Very easy	22	22	44	10.3	10.3	20.6
	Easy	38	46	84	17.8	21.5	39.3
	Very difficult	5	5	10	2.3	2.3	4.7
	Difficult	16	21	37	7.5	9.8	17.3
	Never taught	21	18	39	9.8	8.4	18.2
		102	112	214	47.7	52.3	100
D. PLANE GEOMETRY **Angles at a point, Angles and intercepts on parallel lines, Triangles and other polygons, Circles, Construction, Loci.**	Very easy	15	5	20	7	2.3	9.3
	Easy	38	48	86	17.8	22.4	40.2
	Very difficult	9	13	22	4.2	6.1	10.3
	Difficult	26	32	58	12.1	15	27.1
	Never taught	13	15	28	6.1	7	13.1
		102	112	214	47.2	52.8	100
E. TRIGONOMETRY **Sine, cosine and tangent of an angle, Angles of elevation and depression, Bearings.**	Very easy	24	14	38	11.2	6.5	17.8
	Easy	50	63	113	23.4	29.4	52.8
	Very difficult	4	9	13	1.9	4.2	6.1
	Difficult	17	23	40	7.9	10.7	18.7
	Never taught	7	3	10	3.3	1.4	4.7
		102	112	214	47.7	52.2	100
F. STATISTICS AND PROBABILITY **Statistics, Probability.**	Very easy	34	33	67	15.9	15.4	31.3
	Easy	50	58	108	23.4	27.1	50.5
	Very difficult	3	6	9	1.4	2.8	4.2
	Difficult	11	9	20	5.1	4.2	9.3
	Never taught	4	6	10	1.9	2.8	4.7
		102	112	214	47.7	52.3	100

Table 2: Respondents' opinion on their choices in table 1

RESEARCH QUESTIONS	**R E S P O N S E**				
	Yes	No	Total	% Yes	% No
CONTENT AREA A. (i) Is the theme well taught?	158	56	214	74	26
(ii) Is the theme interested?	135	79	214	63	37
(iii) Are there adequate teaching aids?	117	97	214	55	45
CONTENT AREA B. (i) Is the theme well taught?	89	125	214	42	58
(ii) Is the theme interested?	77	137	214	36	64
(iii) Are there adequate teaching aids?	64	150	214	30	70
CONTENT AREA C. (i) Is the theme well taught?	123	91	214	58	42
(ii) Is the theme interested?	130	84	214	61	39
(iii) Are there adequate teaching aids?	138	76	214	64	36
CONTENT AREA D. (i) Is the theme well taught?	81	133	214	38	62
(ii) Is the theme interested?	101	113	214	47	53
(iii) Are there adequate teaching aids?	78	136	214	36	64
CONTENT AREA E. (i) Is the theme well taught?	131	83	214	61	39
(ii) Is the theme interested?	146	68	214	68	32
(iii) Are there adequate teaching aids?	123	91	214	57	43
CONTENT AREA F. (i) Is the theme well taught?	166	48	214	78	22
(ii) Is the theme interested?	177	37	214	83	17
(iii) Are there adequate teaching aids?	161	63	214	71	29

(iv) Employing ICT in teaching can assist in simplifying these difficult concepts.

Conclusion

In this paper, Plane Geometry and Algebraic Processes are identified as the most difficult content areas in 'O' level Mathematics. These areas can be simplified to increase students' academic achievement in mathematics if appropriate teaching aids are used by instructors. In addition practical examples will assist in reducing the abstractness of some of these concepts thereby making them interesting to the learners.

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