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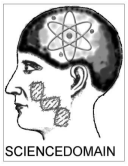

Remedial Students' Perception of Difficult Concepts in Senior High School Core Mathematics Curriculum in Ghana

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Abstract

This study employed the survey research design aimed at investigating perceived difficult concepts in senior secondary school core mathematics curriculum by remedial students in Ghana. The study was guided by two research questions and the sample for the study was 112 consisting of 62 females and 50 male remedial students graduating from various secondary schools across Ghana who have been unsuccessful (obtained grades in the range D7-F9) in the WASSCE particularly in core mathematics. The instrument used for the collection of data was a 38-item questionnaire tagged Difficult Concept Identification Questionnaire in Mathematics (DCIQM). The data obtained were analyzed using mean with the criterion mean set at 3.05 for identifying difficult topics and 3.6 for identifying possible causes of the perceived difficulty. **C**ronbach's Coefficient Alpha was used to estimate the reliability of the study which was found to be 0.942. The findings revealed a strong positive linear correlation (spearman's rank correlation coefficient of 0.56) between topics perceived by male and female students as difficult. However, there was a strong negative linear correlation (-0.65) between the topics perceived by science and non-science students as difficult. Another finding of the study revealed that students identified some mathematics topics such as Ratio and Proportion, Circle theorem, Plane Geometry, Trigonometry & Bearings, Mensuration, Sequence and Series, Business Mathematics, Logarithms, Coordinate Geometry and Similar Triangles as difficult. As part of the findings of the study, students perceived core mathematics as the most difficult core subject. One other important finding of this research was that most

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SHS students developed their poor dislike and “sense of difficulty” for mathematics from the JHS level. Based on the findings of the study, it was recommended amongst others that workshops should be organized to train mathematics teachers on the effective and efficient strategies that should be adopted for the teaching of the identified difficult mathematics concepts.

Keywords: Perception; difficult concept; curriculum; remedial.

1 Introduction

In Ghana mathematics is a perceived as a subject which is reserved for the brilliant students. Many who have managed to pass in the subject often refer to it as the subject that was scary and difficult to pass. Many careers such as Engineering and other science dominated careers often requires one to pass in several mathematical modules. This is perhaps the reason underpinning the only few people in mathematics inclined fields. Most people after high school education often do not want to be involved in any other mathematical experience.

People who pursue mathematics dominated careers are often regarded to be unusual beings and are regarded as special people. Mathematics is a subject which most students often dislike or fear at all levels of life. Therefore, the main aim of this study is to investigate perceived difficult concepts in senior secondary school core mathematics curriculum by remedial students in Ghana.

It is widely claimed that, negative perceptions and myths of mathematics are widespread among the students, especially in the developed countries [1]. Sam (2002) claimed that many students are scared of mathematics and feel powerless in the presence of mathematical ideas [2]. They regarded Mathematics as "difficult, cold, abstract, and in many cultures, largely masculine" [3]. Buxton, cited by Sam (2002) viewed mathematics as "fixed, immutable, external, intractable and uncreative" or "a timed test"[2]. Even scientists and engineers whose jobs are related to mathematics "often harbour an image of mathematics as a well-stocked warehouse from which to select ready-to-use formulae, theorems, and results to advance their own theories"[4,5].

Educators attempt to explain this phenomenon through the widespread beliefs or mathematical myths that "learning mathematics is a question more of ability than effort" [6] or "there is an inherent natural ability for mathematics" [7]. Many people hold the view that mathematics is only for the clever ones, or only for those who have 'inherited mathematical ability'. Another widely held belief is that mathematics is a male dominant subject. One other stereotyped image is that boys are better in mathematics than girls [3].

Thus, many adults accept this lack of accomplishment in mathematics as a permanent state over which they have little control. Parents and significance others have a strong influence on students’ beliefs and attitudes towards mathematics [6]. Students’ mathematics learning outcomes are strongly related to their beliefs and attitudes towards mathematics [5]. According Sam (2002) parents’ views about mathematics have strong effect on the way they teach their children [2]. This often creates tension between the parents and teachers if they share contrasting images of mathematics.

One origin of different student perceptions is the individual life histories that each student brings to mathematics learning. These life histories influence the way the students position themselves in the classroom, the way they engage with mathematics, teacher and peers and the way they interpret mathematical experiences. On the other hand, there are contextual factors that students of the same class share with each other. These are, for example, the personality of the teacher, quality of teaching and learning support material, interests in mathematics, self –confidence and general proficiency in the subject. These influence all students in a class and are the origin of shared experiences. Moreover, also students’ individual experiences are partly shaped by the shared events in the classroom. This is illustrated with an arrow from classroom context to individual experiences.

The knowledge of mathematics is an essential tool in our society [8]. It is a tool that can be used in our daily life to overcome the difficulties faced [9]. Due to this, mathematics has been considered as one of the most important core subjects in a school curriculum. More mathematics lessons are likely to be taught in schools and colleges throughout the world than any other subject [10]. However, the standard tests and evaluations reveal that students do not perform to the expected level. The student under achievement in mathematics (M=60.01, and 45.02,SD=26.04 and 23.04 for COOP + META and COOP students respectively) is not just a concern for particular countries, but has become a global concern over the years [11].

Several studies and researches have been done in many countries to find the factors that influence the students‟ performance in mathematics. Among these factors, students‟ perception towards mathematics is one important factor that has been consistently studied. Often, the studies on relationship between students‟ attitude and the students‟ academic performance show a positive relationship [12]. Hence students‟ attitude towards mathematics is a major factor that might influence the performance of the students. Due to this several studies has been conducted in different countries in order to find out the students attitude towards mathematics [13] and hence to use these data to suggest the low performance of students and factors affecting it. The aim of this research is to find out the secondary students‟ perception towards mathematics among remedial students in Ghana. The research will focuses on finding the students‟ perception towards mathematics and also finding the significant difference between students‟ perceptions towards mathematics with regard to gender of the students.

It is anticipated that the findings of this study will give curriculum developers new insights into emerging issues on performance and influence the Ministry of Education on policy formulation. Students are also expected to benefit from the findings; because improved mathematics performance will give them opportunities to pursue science related courses in higher institutions of learning and middle level colleges.

1.1 Statement of the problem

According to Anamuah-Mensah (2007), the utilisation of science, mathematics and technology has been interlinked with the improvement in productivity and wealth creation of a nation. This explains why it is important to have skilled human resources in science, mathematics and technology as a nation. The key to the economic development of Ghana, therefore, depends on the development of a strong science, mathematics and technology base [14].

Mathematics enjoys a lot of recognition and respect from policy makers, educational institutions and the world of work. The study of mathematics is important because it is associated with more of academic and career opportunities and at the same time acts as one of the critical filters for entry into higher educational programmes and even in the world of work [14]. Thus, without sufficient knowledge in mathematics, one may not climb the academic ladder. In addition, people who resort to learning a trade because of their inability to make the required grade for further studies end up using mathematics as an important tool for performing their duties in their work places.

Core Mathematics is one of the four core subjects (compulsory) that a candidate is expected to pass (A1-C6) in addition to three other electives to enable one to qualify to pursue tertiary education. In 2016, 27.68% of the West African Secondary School Certificate Examination (WASSCE) candidates obtained weak passes (D7-E8) and a whopping 38.10% had F9 (Fail) in Core Mathematics. This means about 65.78% of candidates are unable to further their education to the tertiary level due to a weak pass or total failure in Core Mathematics. This should be a great matter of concern to all stakeholders of education. There have been numerous reports of cases of examination malpractices among students. This to a large extent explains the fact that students have certain fear for examinations especially in Mathematics. Despite the importance of mathematics in human development, many investigations have shown that students in secondary schools are not very much interested in mathematics [15]. Yara (2009) showed that majority of students saw mathematics as a subject with many technical terms which are difficult to remember [16].

The West African Examination Council (WAEC) chief examiners' report has shown that there is over a decade-long poor performance of students in mathematics despite improved teaching methods and motivational learning strategies. This trend is frustrating to students' aspiration for higher education in areas where a credit in mathematics is required and general cognition of the subject. There is the need to know what students perceive about each topic in the mathematics curriculum in terms of difficulty and to know what in their view the contributors to such level of difficulty are.

1.2 Research questions

1. Is there any significant difference between male and female students' perception of difficult concepts in Core Mathematics curriculum?
2. Is there any significant difference in the achievement of students in Mathematics when it is taught by male or female teachers as perceived by students?
3. What are the concepts senior secondary schools students' perceive as difficult?
4. What are the causes of the difficulties experienced by the senior secondary school students in math?
5. Is there any significant the topics difference between perceived by male and female students as difficult?
6. Is there any significant difference between the topics perceived by science and non-science students as difficult?

1.3 Purpose of the study

The purpose of the study was to investigate the perceived difficult concepts in senior secondary school core mathematics curriculum by remedial students.

Remedial students were selected in this study by virtue of the convenient sampling technique adopted by the researcher.

Specifically, the objectives of the study are to:

1. Find if there is there any significant difference between male and female students' perception of difficult concepts in Core Mathematics curriculum.
2. Find if there is any significant difference in the achievement of students in Mathematics when it is taught by male or female teachers as perceived by students.
3. Determine the concepts senior secondary schools students' perceive as difficult.
4. Determine the causes of the difficulties experienced by the senior secondary school students in math.
5. Find if there is any significant the topics difference between perceived by male and female students as difficult.
6. Find if there is any significant difference between the topics perceived by science and non-science students as difficult.

2 Methods and Materials

The study employed survey design. A sample of 112 remedial students was obtained by convenience sampling. The sample for the study was 112 consisting of 62 females and 50 male remedial students graduating from various secondary schools across Ghana who have been unsuccessful (obtained grades in the range D7-F9) in the WASSCE particularly in core mathematics. Convenience sampling technique was adopted in this study as the sample used for the study were students who had registered at Ideal College Remedial School in Ghana. These students were registered to re-sit core mathematics in the WASSCE

private examination. The data obtained were analyzed using mean with the criterion mean set at 3.05 for identifying difficult topics and 3.6 for identifying possible causes of the perceived difficulty. Microsoft Excel and SPSS software were used in the analysis of the data. Spearman's rank correlation coefficient was used to determine the correlation between the two variables. The five point -Likert scale were coded as strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, strongly Disagree =1. **C**ronbach's Coefficient Alpha is an extension of the split-half method of estimating reliability. Using one pair of random halves of the items is likely to differ from that obtained using another pair of random halves of the items. One solution to this problem is to compute the Spearman-Brown corrected split-half reliability coefficient for every one of the possible split-halves and then find the mean of those coefficients. This mean is known as Cronbach's coefficient alpha. Spearman Brown correction is given by $\boxed{r_{sb} = \frac{2r_{hh}}{1+r_{hh}}}$.

Where r_{hh} is the split half coefficient.

The criterion mean was calculated as follows:

Criterion mean or Grand mean, $\overline{\overline{X}} = \frac{\sum_{i=1}^{n} \overline{X}_i}{n}$, where n is the number of means.

Where $\overline{X} = \frac{\sum_{i=1}^{n} X_i}{N}$, where N is the sample size. Data analysis is performed using Microsoft Excel (windows 10) and IBM SPSS STATISTICS (2015), V23.0, SPSS Inc.

Linear correlation coefficient (r) is given by:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

3 Results and Discussion

From Table 1, topics such as Ratio and Proportion $(3.90: \overline{X} > 3.05)$, Circle Theorem $(3.94: \overline{X} > 3.05)$, Similar Triangles $(3.52: \overline{X} > 3.05)$, Plane Geometry $(3.63: \overline{X} > 3.05)$, Trigonometry & Bearings $(3.37: \overline{X} > 3.05)$, Logarithms $(3.13: \overline{X} > 3.05)$, Mensuration $(3.33: \overline{X} > 3.05)$, Business Mathematics $(3.54: \overline{X} > 3.05)$, Sequence and Series $(3.22: \overline{X} > 3.05)$ and Coordinate Geometry $(3.17: \overline{X} > 3.05)$ were found to be the most difficult as perceived by the students. In general students appeared to have little or no knowledge of Global Mathematics with many leaving the place blank on the questionnaire and so it was exempted from the study.

Firstly, students found Ratio and Proportion a difficult concept $(3.90: \overline{X} > 3.05)$. This means they could not solve satisfactorily problems on direct and indirect (inverse) proportion and their applications. They could not adequately express ratio between two similar properties; and could not express proportions between two or more similar quantities. They could also not apply these concepts in real life situations.

Table 1. Identification of difficult concepts

S/N	Topic is difficult?	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean ($\overline{X}$)	Decision
		N	N	N	N	N		
1	Algebraic Expression	50	72	138	36	22	2.750000	Not Difficult
2	Real Number System	70	92	108	52	18	3.035714	Not Difficult
3	Binary Operation	81	76	114	48	17	3.000000	Not Difficult
4	Modular Arithmetic	85	44	45	74	24	2.428571	Not Difficult
5	Numeration System	25	76	126	54	18	2.705357	Not Difficult
6	Ratio & Proportion	40	100	132	152	13	3.901786	Difficult
7	Variation	80	104	106	16	8	2.803571	Not Difficult
8	Circle Theorem	255	96	384	16	6	3.937500	Difficult
9	Similar Triangles	160	108	192	24	10	3.517857	Difficult
10	Plane Geometry	220	112	60	10	4	3.625000	Difficult
11	Trigonometry & Bearings	140	92	90	28	27	3.366071	Difficult
12	Vectors	75	112	102	20	12	2.866071	Not Difficult
13	Construction	65	48	144	2	19	2.482143	Not Difficult
14	Mensuration	155	92	87	32	7	3.330357	Difficult
15	Logical Reasoning	180	100	39	18	0	3.008929	Not Difficult
16	Surds	75	60	114	48	17	2.803571	Not Difficult
17	Indices	65	64	117	44	15	2.723214	Not Difficult
18	Logarithms	110	88	114	26	12	3.125000	Difficult
19	Transformations	60	72	69	58	19	2.482143	Not Difficult
20	Sets & Operations	50	96	108	32	17	2.705357	Not Difficult
21	Business Mathematics	190	92	69	36	10	3.544643	Difficult
22	Sequence &Series	130	92	93	36	10	3.223214	Difficult
23	Relations & Functions	80	104	90	46	11	2.955357	Not Difficult
24	Probability	90	100	102	20	4	2.803571	Not Difficult
25	Statistics	75	84	105	30	17	2.776786	Not Difficult
26	Coordinate Geometry	140	96	87	20	12	3.169643	Difficult
27	Quadratic Equ. & Functions	110	60	102	28	24	2.892857	Not Difficult
28	Global Mathematics	****	****	****	*****	****	*****	*****

Secondly, Circle Theorem was found to be the most difficult concept as perceived by the students $(3.94 : \overline{X} > 3.05)$ in the SHS curriculum in Ghana. This means students could not identify and apply the needed theorems of circle to solving problems. The theorems include the following:

i. The angle subtended at the circumference of a circle by the ends of a diameter is 90^0.
ii. The angles subtended at the circumference of a circle by the ends of at the same chord are congruent.
iii. The angle subtended at the circumference of a circle by radii is one-half the angle formed between the radii.
iv. Equal chords subtend equal angles at the Centre of a circle.
v. The angle formed between a radii and a tangent is 90^0 (they are orthogonal).
vi. The interior opposite angles of a cyclic quadrilateral are supplementary.
vii. The angle between a chord and a tangent is congruent to the interior angle directly opposite to the chord.
viii. In a cyclic quadrilateral, an interior angle is equal to the exterior angle the opposite interior angle.
ix. The angle between two tangents to a circle is supplementary with the angle formed between the two radii.

Again, Similar Triangles concept was also perceived by the students as difficult $(3.52 : \overline{X} > 3.05)$ as they could not identify and use the equiangular properties and ratio of sides and areas well enough in solving problems.

Another concept perceived to be difficult was Plane Geometry $(3.63 : \overline{X} > 3.05)$. This means SHS students have problems understanding:

i. Angles and their properties such as vertically opposite angles, angles at a point, adjacent angles on a straight line; complementary, supplementary, reflex and acute angles and their applications.
ii. Angles and intercepts on parallel lines: alternate angles are equal, corresponding angles are congruent and interior opposite angles are supplementary.
iii. Triangles and Polygons: Properties of interior and exterior angles of regular and irregular polygons. Properties of special triangles and quadrilaterals.

Trigonometry and Bearings have also been perceived as another difficult concept $(3.37: \overline{X} > 3.05)$. SHS students therefore have problems with the following concepts:

i. Application of trigonometric ratios in finding angles in the four quadrants
ii. Drawing trigonometric graphs and solving associated problems
iii. Angles of elevation and depression
iv. Simplifying and evaluating trigonometric expressions
v. Solving simple trigonometric equations
vi. Finding back-bearings and applying the concept of bearings in real life problems.

Logarithms were also found to be a difficult concept in the SHS syllabus $(3.13: \overline{X} > 3.05)$. Meaning the following concepts were not clearly understood:

i. Laws of logarithms and applications of laws to evaluate and simplify logarithmic expressions and solving logarithms equations.
ii. Using logarithm tables to evaluate or simplify expressions.

Business Mathematics was another concept perceived as difficult $(3.54 : \overline{X} > 3.05)$. The problems in this concept were as a result of the lack their understanding of the following areas:

i. Percentages and their applications which include concepts such as Simple Interest, Compound Interest, Profit and Loss, Commission, Depreciation, Business Partnership, Hire purchase, Percentage error, Taxation, Depreciation(Amortization) and Discounts.

Mensuration was another concept perceived as difficult $(3.33: \overline{X} > 3.05)$. The problems in this concept were as a result of the lack of their understanding of the following areas:

i. Applications of Pythagoras theorem, length of arcs of circles, perimeters of segments and sectors
ii. Areas of triangles, special quadrilaterals
iii. Circle , sectors and segments of circles
iv. Surface areas of cubes, cuboids, cylinder, pyramids, prisms, cones and spheres
v. Volumes of cubes, cuboids, cylinders, cones, prisms and right pyramids and spheres

Also Sequence and Series $(3.22: \overline{X} > 3.05)$ was yet another concept that was perceived as difficult. This is due to their lack of understanding of the following concepts:

i. Patterns of sequence
ii. Arithmetic Progression
iii. Geometric Progression (Exclude sum of G.P)

Last but not least, Coordinate Geometry $(3.17: \overline{X} > 3.05)$ was also perceived as difficult. This is due to problems in the following areas:

i. Concept of x-y plane
ii. Midpoint of two points
iii. Distance between two points
iv. Gradient/ slope of a line

From Table 2, students have knowledge of some of the factors that can cause mathematics concepts to be difficult. Students agreed with items 2, 3, 4, 5, 7 and 9. Students did not agree with items 1, 6, and 8. The agreement or disagreement was based on the criterion mean of 3.6.

Table 2. Causes of difficulty of concept in mathematics

S/N	Causes of difficulty of concept in mathematics	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Mean ($\overline{X}$)	Decision
1	Math teacher used discouraging words about the subject	70	40	30	28	64	2.071429	Disagree
2	Class size was above 40	375	56	36	8	3	4.05357	Agree
3	The syllabus was not completed	350	40	30	4	3	3.81250	Agree
4	I did not practice math on my own aside work given by teacher	375	68	15	14	8	4.28571	Agree
5	I had math problem since JHS	395	80	15	2	16	4.53571	Agree
6	SHS duration is 3 years instead of 4 years	250	64	15	10	5	3.07143	Disagree
7	My math teacher had difficulty with some topics in math himself/herself	265	40	87	32	4	3.82143	Agree
8	Math teacher not punctual	150	120	6	20	40	3.00000	Disagree
9	Math is the most difficult core subject in SHS	320	112	15	20	5	4.21429	Agree
10	My math teacher was not of my preferred gender	200	108	45	30	15	3.5536	Agree

It is obvious from the findings that mathematics teachers in schools do not use discouraging words towards mathematics. Another finding is Mathematics teachers have also been found to be punctual to classes. Surprisingly, students found the gender of a math teacher as a contributing factor to problems in understanding concepts in core mathematics. Students perceived core mathematics as the most difficult core subject. Again, students did not find the duration of SHS whether 4 years or 3 years as a reason to why they perceive core math a difficult subject. However, students agreed that if the class sizes of mathematics are below 40, it will enhance learning and probably encourage teachers to give more exercises and assignment as well as mark them and give feedback to students. Students conceded to the fact that teachers fail to complete the syllabus which in turn increase their fear and lower confidence level towards the subject. If the syllabus is completed before they write the examination, they will have more questions and options to choose from which enhance their achievements. The results also show that regular practice of math problems will expose students to more experience and will reduce their errors and misconceptions. One other important finding of this research is that most SHS students developed their poor dislike and "sense of

difficulty" for the subject from the JHS level. Students alluded to the fact that math teachers have some difficulty in some areas in the core mathematics curriculum.

Table 3. Perception on the preferred gender of mathematics teacher

Perception on the preferred gender of mathematics teacher	Male teacher preference		Female teacher		Don't think it matters	
	Number	%	Number	%	Number	%
Male student	32	28.6	6	5.4	16	14.1
Female student	34	30.4	4	3.6	20	17.9
Total	66	59.0	10	9.0	36	32.0

From the table, 59% of the respondents preferred their math teacher as male and 9% preferred female. However, 32% did not think the gender of a math teacher matters. Also, more girls than boys preferred to be taught by a male math teacher. Research need to be carried out to find the reasons to why students preferred to be taught mathematics generally by a male teacher rather than female.

Table 4. Test of significance

	Value	df	P-value
Pearson Chi-Square	2.000[a]	1	0.157

There was a statistical outcome that there was a statistical difference between the gender of math teacher as perceived by male and female students $\left(\chi^2 = 2.00,\ \mathrm{df} = 1,\ \mathrm{p} > 0.05\right)$.

Table 5. Difficult Topics perceived by male and female students

Topic	Male		Female	
	Difficult	Not difficult	Difficult	Not difficult
Ratio and Proportion	43	7	44	8
Circle Theorem	45	5	55	12
Similar Triangles	41	9	50	12
Plane Geometry	37	18	45	22
Trigonometry and Bearings	36	14	45	17
Mensuration	42	9	51	10
Logarithms	37	11	45	13
Sequence and Series	36	14	44	18
Coordinate Geometry	36	14	45	19
Business Mathematics	38	13	46	15

Table 6 shows there was a significant difference $\left(\chi^2 = 45.00,\ \mathrm{df} = 30,\ \mathrm{p} < 0.05\right)$ between the topics perceived by male and female students as difficult.

Table 6. Test of significance

	Value	df	P-value
Pearson Chi-Square	45.000[a]	30	0.039

Tables 6 and 7 make it evident that females significantly perceived more concepts as difficult than the male students.

Table 7. Descriptive statistics

	Mean	Std. deviation
Male	36.60	8.934
Female	43.90	10.806

Table 8. Test of significance

	Value	df	P-value
Pearson Chi-Square	52.500[a]	48	0.304

Table 6 shows there was no significant difference $\left(\chi^2 = 52.50,\ \mathrm{df} = 48,\ \mathrm{p} > 0.05\right)$ between the topics perceived by male and female as not difficult. This means male and female students thought the same way about concepts they perceived as not difficult.

Table 9. Measure of correlation between concepts perceived by male and female students as difficult

Male	Female	Male ranked	Female ranked	d^2 (square of difference)
43	44	2	9.5	56.25
45	55	1	1	0
41	50	4	3	1
37	45	6.5	6.5	0
36	45	9	6.5	6.25
42	51	3	2	1
37	45	6.5	6.5	0
36	44	9	9.5	0.25
36	45	9	6.5	6.25
38	46	5	4	1
				Total d^2 =72

Table 10. Measure of correlation between concepts perceived by science and non-science students as difficult by Rank

Science	Non-science	Science ranked	Non-science ranked	Squared difference
30	59	2.5	8	30.25
32	55	1	10	81
27	61	4.5	4	0.25
26	61	8	4	16
26	70	8	1	49
30	57	2.5	9	42.25
26	61	8	4	16
26	61	8	4	16
26	61	8	4	16
27	60	4.5	7	6.25
				Total=273

Spearman's Rank correlation

$$\rho = 1 - \frac{6\sum_{i=1}^{n} d^2}{n(n^2-1)} = 1 - \frac{6(72)}{10(10^2-1)} = 0.56$$

Therefore there is a strong positive correlation between the topics perceived by male and female students as difficult. This means both male and female students agree to concepts as being difficult.

n = number of paired data, d = difference between corresponding ranks,

Spearman's Rank correlation:

$$\rho = 1 - \frac{6\sum_{i=1}^{n} d^2}{n(n^2-1)} = 1 - \frac{6(273)}{10(10^2-1)} = -0.65$$

There is a strong negative linear correlation between topics perceived by science and non-science students as difficult.

This means to some extent, science students do not perceive as difficult the concepts non-science students may have perceived as difficult. There is an inverse relationship between concepts perceived by male and female students as difficult.

Table 11 shows a significant difference between topics perceived by science and non-science students as difficult.

Table 12 shows a Cronbach's Alpha of 0.942.

Table 11. Test of significance

	Value	df	P-value
Pearson Chi-Square	24.400[a]	15	0.04

Table 12. Reliability statistics

Cronbach's alpha	Cronbach's alpha based on standardized items	N of Items
.940	.942	2

4 Conclusion

This study concludes that there are mathematics concepts that are difficult although the difficulty varies from concept to concept as perceived by students and that students are aware of the factors that can attribute to the concept difficulty.

The study identified topics such as Ratio and Proportion $(3.90: \overline{X} > 3.05)$, Circle Theorem $(3.94: \overline{X} > 3.05)$, Similar Triangles $(3.52: \overline{X} > 3.05)$, Plane Geometry $(3.63: \overline{X} > 3.05)$, Trigonometry & Bearings $(3.37: \overline{X} > 3.05)$, Logarithms $(3.13: \overline{X} > 3.05)$, Mensuration $(3.33: \overline{X} > 3.05)$, Business Mathematics $(3.54: \overline{X} > 3.05)$, Sequence and Series $(3.22: \overline{X} > 3.05)$ and Coordinate Geometry $(3.17: \overline{X} > 3.05)$ as the concepts in the senior secondary school core mathematics curriculum that are perceived by the students as difficult.

Secondly, female students were found to have significantly perceived topics as more difficult than the male students (Mean: 43.90 >36.60).

Also, students significantly preferred to be taught mathematics by male teachers than female teachers.

There was a strong positive correlation between the topics perceived by male and female students as difficult. This means both male and female students agree to concepts as being difficult. There was also a strong negative linear correlation between topics perceived by science and non-science students as difficult. The study discovered that most SHS students developed their poor dislike and "sense of difficulty" for the subject from the JHS level.

5 Recommendations

Based on the findings of this study, the following are recommended:

1. Workshops should be organized for mathematics teachers on the identified difficult mathematics concepts.

2. Class-sizes should be kept below 40.
3. Teachers should encourage independent problem solving habit among students.
4. Teachers must endeavor to complete the syllabus before students write their final examinations.
5. Professional teachers should be engaged in the Junior High School to make the teaching of mathematics effective.

Competing Interests

Author has declared that no competing interests exist.

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