

ANALYSIS OF STUDENTS AND TEACHERS' PERCEPTION OF DIFFICULT CONCEPTS IN SENIOR SECONDARY SCHOOL MATHEMATICS CURRICULUM IN FEDERAL CAPITAL TERRITORY – ABUJA

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Abstract

The study analysed of students and teachers' perception of difficult concept in senior secondary school mathematics curriculum. The study employed descriptive survey design type. The sample of 370 SSII students and 30 mathematics teachers were selected from Twelve (12) secondary schools using simple random sampling technique. The instruments used for data collection were Mathematics Students Questionnaires (MSQ) and Mathematics Teachers Questionnaires (MTQ). The reliability coefficients of the instruments were determined using Alpha Crobach's and reliability coefficient were found to be 0.86 and 0.79 for MSQ and MTQ respectively. Four research questions were raised and two null hypotheses were formulated and tested at 0.05 levels of significant. Statistical tools used were ANOVA and t-test. The result shows that, students perceived six (6) while teachers perceived three (3) concepts as difficult using the mean value less than three. Also, there was significant gender difference in students' perception of difficult concepts in senior secondary school mathematics curriculum. The result revealed that there was significant gender difference in teachers' perception of difficult concepts in senior secondary school mathematics curriculum. It was recommended that government should organize seminars and workshops for teachers on those identified difficult concepts on how best such concepts can be best taught.

Keywords: Perception, Difficult Concepts, Mathematics Curriculum, Students and Teachers, Secondary School Students

Introduction

The importance of Education is to foster full development of the individual so that such individual can contribute to the wellbeing of the society in which he lives. All school subjects are geared towards this important aim, with a view to nurturing collectively and in all ramifications responsible students and citizens (Federal Republic of Nigeria, 2013).

In the past and to even a greater extent today the usefulness of Mathematics in Government and private endeavor has been the important reason for its inclusion as permanent and important subject in the school curriculum. Mathematics is an intellectually stimulating subject that affects every talent activities such as politics, economics, science and technology (Hassan, Terseer, Aruwa & Ndanusa, 2017). Mathematics is a useful tool in the society, more so, in the present technological age. Though not all the students are expected to become Mathematicians, but because of its application in everyday life and for a person to function effectively within his immediate environment, the knowledge of basic mathematics is very necessary. Similarly, Akanni, (2015) viewed Mathematics as basic tool in the development of science based knowledge such as technology, industry and even for the sound analytical reasoning of unfolding issues in a modern society such as ours. It is in light of this that, all over the globe, much effort and time are being expended by Mathematics Educators and practitioners on enhancement of teaching and learning of Mathematics. Hence, the declaration that Mathematics is used in procuring solution to problems, answer to questions which arise in everyday life as humanity strive to satisfy the needs and wants in all areas of enterprise (Odilli,

2008). Mathematics has been described as 'the abstract key which turns the lock of the physical universe' (Linda & Trisha, 2011). Gladys, (2015) sees Mathematics as an essential discipline that is recognized as a tool for solving everyday problem faced and its knowledge enhances a person's reasoning, problem solving skills, and general ability to think. Mathematics plays a key role in the shaping of how individuals deal with the various spheres of life, be it private, social or cooperate.

Despite the importance of Mathematics, students' performance in the subject in West Africa Examination Council (WAEC) and National Examination Council (NECO) Senior Secondary School Examination has remained consistently poor (National Mathematics Centre, 2013). In spite of all the efforts taken to surmount the challenges, the problem of poor performance in Mathematics has continued to reoccur in Senior Secondary Certificate Examination (SSCE), as contained in the West African Examination Council Chief Examiners annual reports (2013, 2014, 2015). Odili (2008), observed that, no nation can achieve meaningful measure of scientific and technological advancement without her citizens acquiring proper foundation in Mathematics. This indisputable claim is supported by Azuka, Jekayinfa, Doroyaye and Okwoza, (2013), as they affirmed that Mathematics is necessary for the progress and effectiveness of a whole series of major field of knowledge.

Research findings show that low performance of students in the subjects at the senior school certificate examinations can be attributed to lack of qualified teachers, low level interest and commitment on the part of Students to Mathematics, the abstract nature of some Mathematics topics, teachers poor knowledge of the subject matter, non-availability of resource materials to teach the subject successfully and over loaded curriculum (Mensah & Kurachie, 2013). Odilli, (2008), attributed the poor performance to insufficient man power, lack of instructional materials, poor attitude of students, poor understanding of the concept involved. Orji, (2015) attributed the causes of poor performance in Mathematics to inadequate exposure to Mathematical experience in the early formative stage in the lives of a vast majority of Nigerian children. Thus by the time those children transit to Secondary School, must have passed through different learning situations that discourage rather than encourage Mathematical learning. Thus overall effect of such unattractive learning situation is lack of understanding of various Mathematical concepts, which lead to inability to solve Mathematics successfully and finally culminates in a hatred for the subject.

A number of research studies on the evaluation of both Junior and Senior Secondary School Mathematics has revealed some fundamental reasons for difficult concepts in Mathematics. As observed by Azuka et al, (2013), one of the causes of difficulty is the common belief that Mathematics as a whole is difficult and full of abstraction that should be pursued only in a clear-cut logical fashion. He contended that the difficult or ease, of teaching/learning any concept in Mathematics depends on the concept in question. He also believed that, students perceived concept as difficult because such concept requires much thinking. The difficulty level of any Mathematics concepts is hinged on the students and teachers related factors. Mathematics teachers are implementers of mathematics curriculum for schools. They form proximal frame factor in the execution of the intended mathematics learning outcomes, this means that teachers could constitute contextual constraint in perception of difficult concept (Clement & Jerry, 2015).

The ability of mathematics teachers to comprehend and internalize concept and skills are determined not only by their knowledge, but also by their competence, which are relative inputs of their experience and qualifications. The latter, in particular will never nonetheless enable them to competently handle all mathematics concept (Gladys & George, 2013). In

another vein, several studies have been conducted to determine the influence of gender in perception of difficult concepts in mathematics. Akanni, (2015) observed that there is no significant gender difference in students-teachers' perception of difficult mathematics topics. Adegun and Adegun, (2013) also revealed that there is no gender difference in teacher's perceived levels of difficulties in mathematics topics. However, difficult concepts invariably affect students' performances in mathematics.

Statement of the Problem

Several attempts to reform the country's educational system have been made, however various stakeholders in education such as Mathematics educators, parents, and government have continuously expressed their concerns on the state of education. One of such attempts was the government's efforts to embark on several policy and curriculum reviews. A notable examples was the recently reviews Basic Education Curriculum of 2013, (Bashir, 2016). However, the poor performance of students in Mathematics in (2011, 2012, 2013, 2014, and 2015) as reported by WAEC Chief Examiners has been a thing of concern to stakeholders, in spite of the tabled research findings and recommendations on improved method of teaching and motivational learning strategies. This trend is frustrating to students' aspiration for higher education where a credit is required in Mathematics before admission. This situation calls for a planned approach which should be based on realistic diagnosis of causes and solution processes of difficult Concepts in Senior Secondary School Mathematics Curriculum as Perceived by the Students and Teachers of FCT.

Research Questions

The following research questions were raised to guide the researcher:

- (i) Which concept in senior secondary school Mathematics curriculum do students perceived as difficult?
- (ii) Which concepts in Senior Secondary School Mathematics curriculum do teachers perceived as difficult to teach?
- (iii) Is there any difference in gender perception of difficult concepts in Senior Secondary School Mathematics curriculum among students?
- (iv) Is there any difference in gender perception of difficult concepts in Senior Secondary School Mathematics curriculum among teachers?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 alpha levels in this study.

- Ho₁:** There is no significant gender difference in students' perception of difficult concepts in senior secondary school Mathematics curriculum.
- Ho₂:** There is no significant gender difference in teachers' perception of difficult concepts in senior secondary school Mathematics curriculum.

Methodology

The research design was descriptive survey type. The sample of 370 SSII students and 30 mathematics teachers was used for the study. Multi stage sampling technique was employed for the study. Firstly, simple random sampling technique was used to select 12 schools out of 62 senior secondary schools in FCT. Stratified sampling technique was used to select 370 SSII students, meaning that 30 students were selected from each of the 2 sampled schools with least population and thirty one students were selected from each of the remaining 10 sampled schools. 30 mathematics teachers were selected for the study, since they were the only mathematics teachers from the sampled schools using convenience sampling technique. The instruments used for data collection were two set of Questionnaires, Mathematics student's questionnaire (MSQ) and Mathematics teachers' Questionnaire (MTQ) with a five points likert

scale. The instruments were validated by expert in the field of Mathematics education. The reliability coefficient of the instruments was determined using Cronbach Alpha. Reliability coefficients were found to be 0.86 and 0.79 on MSQ and MTQ respectively. The data collected were analyzed using the mean to answered research questions for the mean value greater than 3 as difficult. ANOVA and t independent test were used for testing null hypotheses.

Research Question One

Which concept in senior secondary school Mathematics' curriculum do students perceive as difficult?

Table 1: Mean (X), standard deviation and decision of students' responses in perception of difficult concepts in senior secondary school mathematics curriculum

S/N	ITEMS	N	(\bar{X})	SD	Decision
1	Number base system	370	1.96	0.966	Not Difficult
2	Modular Arithmetic	370	2.57	1.165	Not Difficult
3	Indices	370	2.50	1.111	Not Difficult
4	Logarithms	370	2.30	1.099	Not Difficult
5	Set theory	370	3.21	1.108	Difficult
6	Variation	370	2.75	1.136	Difficult
7	Quadratic equation	370	2.54	1.255	Not Difficult
8	Construction	370	3.75	1.212	Difficult
9	Trigonometric ratio	370	3.11	1.191	Difficult
10	Mensuration	370	2.79	1.102	Difficult
11	Statistics	370	2.06	1.111	Not Difficult
12	Sequence and series	370	2.47	1.234	Not Difficult
13	Inequalities	370	2.42	1.218	Not Difficult
14	Circle theorem	370	3.61	1.187	Difficult
15	Sine and cosine of angle	370	2.43	1.181	Difficult
16	The concept of probability	370	2.31	1.201	Not Difficult

Table 1 above shows the mean, standard deviation of responses of students in perception of difficult concepts in senior secondary school mathematics curriculum. The students perceived 6 concepts (37.5%) as difficult, 11 concepts (62.5%) as not difficult based on the criteria for $1 \leq x < 3.0$ as not difficult $3.0 < x \leq 5$ as difficult. This means that student perceived some concepts in senior secondary mathematics curriculum as difficult to learn.

Research Question Two

Which concepts in Senior Secondary School Mathematics curriculum do teachers perceive as difficult to teach?

Table 2: Mean (X), Standard Deviation and Decision of Teachers' Responses in perception of difficult concepts in senior secondary school mathematics curriculum

S/N	ITEMS	N	(\bar{X})	SD	Decision
1	Number base system	30	1.80	0.664	Not Difficult
2	Modular Arithmetic	30	2.13	0.819	Not Difficult
3	Indices	30	2.17	1.020	Not Difficult
4	Logarithms	30	2.17	0.950	Not Difficult
5	Set theory	30	2.30	1.088	Not Difficult

6	Variation	30	2.27	0.980	
7	Quadratic equation	30	2.33	1.213	Not Difficult
8	Construction	30	3.60	1.192	Not Difficult
9	Trigonometric ratio	30	2.17	1.234	Difficult
10	Mensuration	30	3.50	1.075	Not Difficult
11	Statistics	30	1.97	1.159	Difficult
12	Sequence and series	30	2.27	1.015	Not Difficult
13	Inequalities	30	2.20	1.243	Not Difficult
14	Circle theorem	30	3.17	1.234	Not Difficult
15	Sine and cosine of angle	30	2.20	1.031	Difficult
16	The Concept of Probability	30	2.37	0.964	Not Difficult

Table 2 shows the mean, standard deviation and decision of mathematics teacher's responses in perception of difficult concepts in senior secondary school mathematics curriculum. The teachers perceived 3 concepts (18.75%) as difficult and 13 concepts (81.25%) as not difficult. This means that teachers perceive some concepts in senior secondary school mathematics curriculum as not difficult to teach, where few concepts are perceived as difficult.

Hypothesis One

HO₂: There is no significant gender difference in perception of difficult concepts in senior secondary school Mathematics curriculum among the students.

Table 3: Summary of Analysis of Variance (ANOVA) on gender mean difference in perception of difficult concepts in senior secondary school Mathematics curriculum among the students

Source	Sum of Square	df	Mean Square	F _{cal.}	P-value
Between Group	575.340	1	575.340		
Within Group	47333.977	373	126.901	4.534	0.034
Total	47909.317	374			

*Significant at $p < 0.05$

Table 4 shows the Analysis of Variance (ANOVA) difference between male and female students response on difficult concepts in senior secondary school Mathematics curriculum. The p-value of 0.034 which is significant at 0.05 level. From the table the result indicated that at $F(1, 373) = 4.534, p \leq 0.05$. Hence the null hypothesis stated was rejected. Therefore, there is significant gender difference in perception of difficult concepts in senior secondary school Mathematics curriculum among students.

Hypothesis Two

HO₂: There is no significant gender difference in perception of difficult concepts in senior secondary school Mathematics curriculum by the teachers.

Table 4: Summary of Independent test of gender difference in perception of difficult concepts in senior secondary school Mathematics curriculum among teachers

Variables	N	\bar{X}	SD	df	t	P-value
Males	20	55.33	15.361	28	0.565	0.458
Females	10	47.47	13.125			

Table 4.11 shows the t-test independent comparing mean difference between male and female teachers in perception of difficult concepts in senior secondary school Mathematics curriculum. The mean score and standard deviation of the male teachers are 55.33 and 15.361 respectively while those of the female teachers are 47.47 and 13.125. The result shows that the $t = 0.565$, $df = 28$, $P > 0.05$). Hence the null hypothesis stated above that, there is no significant gender difference in perception of difficult concepts in senior secondary school Mathematics curriculum by the teachers was not rejected but accepted.

Summary of the Findings

The following are summary of the findings from the study.

- (i) Students perceived 6 mathematics concepts in senior secondary school mathematics curriculum as difficult. These concepts are: set theory, variation, construction, trigonometric ratio, mensuration, circle theorem. These are concept that have the mean value greater than 3.
- (ii) Mathematics teachers perceived 3 mathematics concepts as difficult. These concepts are: construction, mensuration, and circle theory.
- (iii) Gender has significant influence on students' perception difficult concepts in senior secondary school mathematics curriculum.
- (iv) Gender has no influence on teachers' perception of difficult concepts in senior secondary school mathematics curriculum.

Discussion

The outcome of the study in table 1 revealed that students perceived 6 mathematics concepts (37.5%) as difficult out 61 mathematics concepts in senior secondary school mathematics. These concepts are: set theory, variation, construction, trigonometric ratio, mensuration, circle theorem. These findings correspond with Gladys and George, (2015) who revealed that students perceived 11 mathematics concepts as difficult. From table 2 the result shows that mathematics teachers perceived 3 concepts out of 16 mathematics concepts as difficult. These concepts are: construction, mensuration and circle theory. It is observed that students and teachers perceived construction, mensuration and circle theory as difficult. Consequently, the low performance of students at the WASSCE in mathematics should not be undermined if these concepts dominate the question papers. The findings of the study are in line with Adegun and Adegun, (2013) who observed that teachers and students perceived construction and loci as most difficult concept to teach and to learn respectively. In the same vein, Akanni, (2015) revealed that teachers perceive construction, mensuration, trigonometry, probability, statistics Arithmetic Progression (AP), Geometrical Progression (GP), bearing and distance, Latitude and Longitude as difficult to teach.

Table 3 revealed that there is significant gender difference in perception of difficult concepts in senior secondary school mathematics among students. The p-value 0.034 is less than 0.05 level of significant at $F(1,373) = 4.534$. This implied that gender influence student perception of difficult concepts in senior secondary mathematics school curriculum. These findings are in line with Fabiyi, (2017) that gender has influence on the number of geometry concepts perceived difficult by males and females. Also, the findings disagreed with Hassan e tal, (2017) that there is significant difference in males and females student interest in mathematics. Table 4 shows that there is no significant gender difference in perception of difficult concept in senior secondary school mathematics curriculum by teachers. The p - value = 0.458, $t = 0.565$, $df = 28$, $p > 0.05$, this means that gender has no influence in perception of difficult mathematics concepts in senior secondary school mathematics curriculum. The findings are in agreement with Akanni, (2015) that there is no significant gender difference in students and teachers perception of difficult mathematics topics. Also in line with Adegun and Adegun, (2013) that, there is no significant difference in the perceived level of difficulty of mathematics topics by males and females teachers.

Conclusion

The main focus of this study was to analyze students and teachers' perception of difficult concepts in senior secondary school mathematics curriculum. The study also examined the influence of gender in perception of difficult concepts in senior secondary school mathematics curriculum among students and teachers. The study also revealed that the students perceived 6 mathematics concepts as difficult and teachers perceived 3 mathematics concepts as difficult. The implication of this is that, performance of students in mathematics will continue to be low when the quality and commitment of the teacher handling the subject is low.

Recommendations

From the findings, it is recommended that:

- (i) The identified difficult mathematics concepts by the students should be taught using appropriate method of instruction to enhance student interest and achievements.
- (ii) Workshop and seminars should be organized for mathematics teachers on ways of teaching the identified difficult mathematics concepts.
- (iii) Qualified teachers should be employed to teach mathematics in all secondary schools.
- (iv) Both male and female students should be encouraged to learn mathematics with greater emphasis on female students
- (v) Curriculum planner should endeavour to arrange mathematics concepts in a way that will not be too complex for teachers to teach and for the students to learn and understand.

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