# Assessing Students Perception of Difficult Topics in Mathematics at Senior Secondary Schools in Kano, Nigeria

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**Abstract:** This study was conducted to assess the students' perception of difficult topics in mathematics in some selected senior secondary schools (SS) in Kano state Nigeria. Two hundred (200) SS final year (III) students were randomly selected from ten (10) selected senior secondary schools within Bichi zone of Kano state Nigeria. A twenty items questionnaire was administered to respondents. Mean, standard deviation, and independent sample t-test statistics were used to analyze the data. Findings revealed that students perceived 13 topics (65%) difficult to comprehend. The study also showed that students' gender had a significant influence on their perception of difficult topics in mathematics [t (198) =2.34, P =0.020, $\alpha$ = .05] and the nature of students' schools had no significant influence on their perception of difficulty in mathematics [t (198) = -.444, p = 0.657, $\alpha$ = .05]. It was recommended that students should be encouraged and motivated to learn mathematics, curriculum developers should develop instructions that would improve students' knowledge by laying more emphasis on the perceived difficulty areas in mathematics and further studies should be conducted to find out the factors responsible for the perceived difficulty and also if there is a relationship between perception and students' achievement.

**Keywords:** *Perception, Mathematics, curriculum, perceived difficulty.*

## Introduction

The importance of mathematics to an individual and society is acknowledged worldwide (Githua, 2013). The importance of mathematics in all realms of life and the recent debate on the falling standards of students' achievement in mathematics has triggered the growing attention for science educators, researchers, parents, and education authorities in their quest for the way forward over the last two decades (Blum, 2002). Over the years the persistent students' low level of achievement in mathematics at the various public examinations in Nigeria continue to attract the attention of major stakeholders in education. Performance of students in mathematics has consistently been poor and unimpressive. Despite all of the considerable efforts made by policy makers at various levels, very little improvement in students' achievement has been recorded. Available data from the two public examination bodies; the West African Examination Council (WAEC) and National Examination Council (NECO) SSCE indicates that, students' achievement in mathematics at the senior secondary school level continue to decline owing to the fact that many students seen to have negative attitude towards the subject.

The federal government of Nigeria, in order to equip students to live effectively in the modern age science and technology, lays an emphasis on science education which is taught at all levels of education and made compulsory at both primary and secondary schools. At tertiary level, it is a compulsory requirement for admission especially in pure and social sciences programs and it is part of the General Studies for students in all fields of studies. Similarly, Adegun and Adegun (2013) highlighted that for admission purposes into tertiary institutions; the ratio of science to liberal arts is 60 to 40 per cent with functionality and integration of theory and practical as paramount aims. The conceptions, attitudes, and expectations of the students regarding mathematics have been considered to be very significant factor underlying their school experience and achievement; therefore, better understanding of any topic lies on the awareness, comprehension, and personal interpretations.

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According to Adeyegbe (1994), it had been investigated and shown that low level of achievement of students in the subjects at the senior school certificate examinations was due to the lack of qualified teachers, low level of interest, and commitment on the part of students, the abstract nature of some of the topics, teachers poor knowledge of the subject matter, non-availability of resource materials, and over loaded curriculum.

Mutodi and Ngirande (2014**)** investigated the influence of students' perceptions on mathematics performance in some secondary schools in South African. The influence of factors such as strength and weaknesses in mathematics, teacher support/learning material, family background and support, interest in mathematics, difficulties or challenges in doing mathematics, self-confidence, and myths and beliefs about mathematics were identified as constructs of perceptions that influence students' performance. 124 students were randomly selected from secondary schools in Polokwane, South Africa for the study. The constructs were found to have influence on students' performance in mathematics. Results from t-tests and ANOVA suggested that there were significant differences in the perceptions and beliefs about mathematics between males and females, between mature and juvenile students, and among students from different language backgrounds respectively. Correlation analysis revealed strong positive relationships between performance and perception constructs. The respondents tend to view lack of proficiency in mathematics as a challenge, and attribute success in mathematics to effort and perseverance. Difficulty in mathematics was also perceived by students as an obstacle, and attribute failure to their own lack of inherited mathematical ability. These findings suggested that differences in (i) myths and beliefs about mathematics success, (ii) motivation given to students, (iii) teaching styles and learning materials, and (iv) self-confidence in the subject may lead to differences in perceptions about mathematics. These, in turn, may lead to differences in attitudes towards mathematics and learning mathematics which have a bearing on performance.

Farooq and Shah (2008) reported that "almost all literature on this topic points to the commonly held perception that doing mathematics is consistent with a male self-image and inconsistent with a female self-image." This self-image is usually caused by the peer pressure. Males are more inclined towards mathematics than females on being the male dominated domain. It is found that at secondary school level most of the girls don't actively participate in mathematics classes due to their poor perceptions about mathematics. Girls are negatively influenced by their sex-role stereotypes (Boswell, 1979; Fennema and Sherman, 1977; Sherman, 1882; Leder, 1982 and Ethington, 1992).

Adegun and Adegun (2013) conducted a study on Students and Teachers' Views of Difficult Areas in Mathematics Syllabus: Basic Requirement for Science and Engineering Education. The population of the study consisted of mathematics teachers and the senior secondary students in Ogbomosho South Secondary Schools in Oyo, Nigeria. 15 mathematics teachers and 180 students were randomly selected for the study. Two self-designed questionnaires were developed to elicit information for the research questions. Appropriate hypotheses were raised based on the research questions. The data were analyzed using frequency count, percentage, Chi-square, and t-test. The results revealed that both teachers and students, qualified and unqualified, experienced and less experienced teachers have the same views of difficult areas in teaching and learning of mathematics in the secondary schools.

Farooq and Shah (2008) in a study conducted to assess the students' attitude towards mathematics using high school students of both genders as the study's population of this study. Sample of 685 students (male = 379 and female = 306) from 10th grade was selected conveniently from 10 private and public sector schools in Pakistan. A questionnaire ($\alpha$ = 0.7452) was used to examine the attitudes of male and female students towards mathematics at secondary school level. Descriptive statistics and t-test with $P < 0.05$ level of significance were used for data analyses. The finding of the study showed that, the male and female students of 10th grade of the secondary schools of Lahore had same type of attitude towards mathematics. It means that gender differential has no impact on the attitude of students towards mathematics in Pakistan.

Yap and Lim-Teo (1999) carried out a study on mathematics teachers' perceptions of their preparedness. They employed teachers that were graduates from local or foreign universities who had undergone the one-year postgraduate diploma in education course at the National Institute of Education in Singapore. In their findings, it was discovered that majority of the participants found the teacher preparation useful, but there were certain topics in mathematics or certain approaches where they would like to have further training.

Ibrahim (1995) analyzed the influence of gender and teacher effectiveness on students' perception of mathematics classes taught by male and female teachers in secondary schools in Irepodun, Local Government Area of Kwara State, Nigeria. He discovered that there was no significant difference in the students' perception of diversity in mathematics classes taught by male and female teachers.

The studies of Fox and Soller (2001) have shown that the learning styles of boys were generally different from the learning styles of girls. They stated that boys and girls preferred competitive and cooperative learning respectively. In addition, perceptions of boys toward mathematics were different from those of girls, which seemed to be likened to perceptions of gender roles and career aspirations.

Despite the strategic importance of mathematics in sciences and technology and the considerable efforts made by researchers and policy makers at various levels, very little improvement in students' achievement has been recorded

because not much was known about the students' interest, awareness and or their personal interpretation regarding mathematics.

By examining the different images, attitudes, believes, and myths of mathematics that students hold, there is a potential for such images, attitudes, beliefs to be challenged, promoted or discouraged (Mutodi and Ngirande, 2014). Students' perceptions of what mathematics is and what it is not, may affect attitudes, performance, confidence, and perceived usefulness of mathematics.

The findings of this study will enhance better strategies and measures for promoting student understanding and participation in mathematics related fields and also reflect possible implication for mathematics education in Nigeria. Knowing how students perceive mathematics will help us to understand better how mathematics should be presented in the classroom.

*Objectives of the Study*

The general purpose of the study was to identify topics perceived as difficult in mathematics by senior secondary schools students in Kano. Specifically, the objectives of this study were;

1. To identify the mathematics topics perceived as difficult by senior secondary school students in Kano State.
2. To find out whether gender difference existed in the students' perception of difficult topics in mathematics at senior secondary schools in Kano State.
3. To determine whether difference existed between boarding and day schools' students on their perception of difficult topics in mathematics at senior secondary schools in Kano State.

*Research Questions*

The following research questions guided the study,

1. Which topics in the senior secondary school mathematics syllabus do students perceive as difficult?
2. Are there any gender difference in students' perception of difficult topics in mathematics syllabus?
3. Does the students' perception of difficult topics in mathematics syllabus differ between boarding and day schools?

*The following hypotheses were formulated and tested for the study*

$H_{o1}$**:** There is no significant gender difference in students' perception of difficult topics in mathematics at senior secondary schools in Kano State.

$H_{o2}$**:** There is no significant difference between boarding and day schools students in their perception of difficult topics in mathematics at the senior secondary schools in Kano State.

**Materials and Methodology**

*Research Design*

This study was a descriptive research; descriptive survey design was adopted to collect the relevant data for the study.

*Participants*

The targeted population for the study was the entire senior secondary schools' students in Kano. A total of two hundreds (200) senior secondary schools students final year (SS III) were randomly selected from ten (10) senior secondary schools in Bichi education zone of Kano State for the study. The SS III students were familiar with the syllabus because through their SS I and SS II theyu had been taught all topics in mathematics syllabus.

*Table 1: Distribution of Participants*

| SN | Variable | Level | N | Percentage |
|----|----------|-------|---|------------|
| | **Gender** | Male | 102 | 51% |
| | | Female | 98 | 49% |
| | **Nature of School** | Boarding | 95 | 47.5% |
| | | Day | 105 | 52.5% |

The distribution of participants is given in the Table 1 above, indicated that 102 students making 51% were male students while 98 students making 49% were female students; this showed that both male and female students were fairly represented. With regard to representation of students based on the nature of their schools, the table showed that 95 respondents making 47.5% were from boarding school, and 105 respondents making 52.5% were from day schools respectively; the distribution indicates that the two different types of schools were fairly represented.

*Instruments*

The instrument used for data collection was the Mathematics Topic Assessment Questionnaire (MTAQ), constructed by the researcher. Section A of the questionnaire was on demographic information of the respondents which includes: Name of the school, Nature of school, Respondent's sex, Class, and Age. Section B consisted of 20 major topics in WAEC/SSCE syllabus covering mathematics. 3-point Likert scale, Difficult (D), Average (A), and Easy (E), was adopted for the study.

*Validation of Instruments*

The instrument was validated by two experienced senior secondary school mathematics teachers and two mathematics lecturers from the Kano State University of Science and Technology Wudil, Kano and Federal University, Kashere Gombe state, and one researcher from the National Mathematical Centre Abuja, Nigeria. The items were pre-tested using 40 students in two randomly selected secondary schools in Kano State who were not participating in the study. 1, 2 and 3 points were assigned to the responses: Easy (E), Average (A), and Difficult (D) respectively. The data obtained was subjected to Kuder Richardson formula 20 to obtain the correlation value. A correlation coefficient of 0.81 was obtained which was considered adequate for this study.

*Procedure for Data Collection*

The Mathematics Topic Assessment Questionnaire (MTAQ) was directly administered by the researcher to the respondents, assisted by the mathematics teachers in the 10 sampled schools.

*Data Analyses Procedure*

The two hundred respondents completed the questionnaire and the responses, Difficult (D), Average (A), and Easy (E), were assigned 3, 2 and 1 points respectively. This data were analyzed through SPSS using descriptive and inferential statistics, such as mean, standard deviation, variance, and t-test. The level of difficulty of a particular topic was determined by the value of means as follows: means less than 1.5 were ($0 \leq x \leq 1.49$) easy, and means between 1.5 and 3.0 were ($1.5 \leq x \leq 3.0$) difficult. To determine students' gender difference and influence of nature of school in their perception of difficult topics in mathematics, t-test was used to analyze the hypotheses. The results were interpreted by comparing the means and by using the t-test at 0.05, level of significance.

## Results/Findings

The results of this study as explained in the preceding section of data analyses procedure were presented in form of descriptive and inferential analysis. Similarly, the results were presented under each research questions and hypotheses and discussed in relation to the findings of other studies, expert opinions', and other validated assertions.

*Research Question One: Which topics in the senior secondary school mathematics syllabus do students perceive as difficult?*

To address this research question, the students' responses on the instruments with regards to difficult topics in mathematics were arranged, scored, and analyzed using descriptive statistics (mean and standard deviation). The difficulty of a topic was determined by the value of means as defined in the analysis procedure as follows: means less than 1.5 ($0 \leq x \leq 1.49$) were easy, and means between 1.5 and 3.0 ($1.5 \leq x \leq 3.0$) were difficult. The results are presented below;

*Table 2: Mean and Standard Deviation of Mathematics Topics*

| SN | Items/Topics | N | Mean | Std. Dev. |
|----|--------------|---|------|-----------|
| 1 | Sequence and Series | 200 | 2.38 | 0.75 |
| 2 | Matrices and Determinants | 200 | 2.34 | 0.80 |
| 3 | Financial Arithmetic | 200 | 2.31 | 0.81 |
| 4 | Variation | 200 | 2.39 | 0.75 |
| 5 | Quadratic Equations | 200 | 2.32 | 0.71 |
| 6 | Graphs of Linear and Quadratic functions | 200 | 2.34 | 0.73 |
| 7 | Areas | 200 | 2.28 | 0.74 |
| 8 | Volumes | 200 | 2.13 | 0.85 |
| 9 | Construction | 200 | 2.28 | 0.87 |
| 10 | Bearings | 200 | 2.12 | 0.88 |
| 11 | Statistics | 200 | 2.04 | 0.90 |
| 12 | Transformation in the Cartesian plane | 200 | 1.99 | 0.88 |
| 13 | Angles of elevation and depression | 200 | 2.09 | 0.84 |
| 14 | Indices | 200 | 1.43 | 0.73 |
| 15 | Logarithms | 200 | 1.49 | 0.78 |
| 16 | Sets | 200 | 1.48 | 0.74 |
| 17 | Solution of Linear Equations | 200 | 1.44 | 0.70 |
| 18 | Linear Inequalities | 200 | 1.23 | 0.57 |
| 19 | Circles | 200 | 1.19 | 0.54 |
| 20 | Number bases | 200 | 1.44 | 0.69 |

Table 2 shows that, the respondents' perceived 13 out of 20 major topics in the secondary school mathematics curriculum as difficult topics. These topics were: Sequence and Series, Matrices and Determinants, Financial Arithmetic, Variation, Quadratic Equations, Graphs of Linear and Quadratic Functions, Areas, Volumes, Construction, Bearings, Statistics, Angles of elevation and Depression, and Transformation in the Cartesian Plane. The finding, of this study revealed that students perceived 13 topics (65%) more than half of the senior secondary mathematics topics as difficult to learn, and then the 7 topics (35%) that were; Number Bases, Indices, Logarithms, Sets, Solution of Linear Equations, Linear Inequalities, and Circles. The findings revealed that the low performance of students in mathematics at the SSCE level may not be surprising since they found most of the topic in the curriculum as difficult to comprehend.

*Hypothesis One (Ho₁)***:** *There is no significant gender difference in students' perception of difficult topics in mathematics at senior secondary schools in Kano State.*

To test the above hypothesis, the mean perception scores of male and female students were used to conduct a test of differences. The coefficient of the differences was determined using Independent Sampled t-test at 0.05 level of significance as presented in table 3 below;

*Table 3: Gender difference in Students' perception of difficult topics in Mathematics*

| Sex | N | Mean | Std. Dev. | df | t-cal | sig. (2-tailed) |
|------|-----|------|-----------|-----|-------|-----------------|
| Male | 102 | 1.85 | 0.457 | | | |
| | | | | 198 | 2.34 | 0.020 |
| Female | 98 | 2.00 | 0.516 | | | |

Table 3 shows students' gender difference and their perception of mathematics topics. It revealed that there was a statistically significant difference in the students' perception of difficult topics in mathematics between male (M=1.85, SD = 0.457) and female (M= 2.00, SD = 0.516), where t (198) = 2.34, p = 0.20, α = 0.05. We, therefore, reject the null hypothesis since there was statistically significant gender difference. Hence the mean score for male and female indicated that male perceive mathematics topics easier than female do (Mean for male=1.85, Mean for female= 2.00).

*Hypothesis two (Ho₂): There is no significant difference between boarding and day schools' students perception of difficult topics in mathematics at the senior secondary schools in Kano State.*

To test the above hypothesis, the mean perception scores of boarding senior secondary schools students and day senior secondary schools students were used to conduct a test of differences. The coefficient of the differences was determined using Independent Sampled t-test at 5% level of significance as presented in table 4 below;

*Table 4: Schools Nature on Perceived Difficult Topics (Boarding & Day)*

| Sex | N | Mean | Std. Dev. | df | t-cal | sig. (2-tailed) |
|----------|-----|------|-----------|-----|-------|-----------------|
| Boarding | 95 | 1.90 | 0.476 | | | |
| | | | | 198 | -0.44 | 0.657 |
| Day | 105 | 1.94 | 0.508 | | | |

Table 4 shows school nature difference on students' perception of mathematics topics. It revealed that there is no statistically significant difference in the students' perception of difficult topics in mathematics between the students from boarding schools (M=1.90, SD = 0.476) and students from day schools (M= 1.94, SD = 0.508), where t (198) = -.444, p = .657, α = .05. We, therefore, accept the null hypothesis on school nature, since there was no statistically significant difference on the students perception based on schools nature.

## Discussions of Findings

The main focus of this study was to survey the perceptions of students, the influence of gender, and nature of schools on the perceived levels of difficulty of mathematics topics. This study showed that both male and female students ranked Graphs of Linear and Quadratic Functions, Sequences and Series, and Variation as having the highest level of difficulty. Also ranked difficult by students were: Matrices and Determinants, Financial Arithmetic, Quadratic Equations, Areas, Volumes, Construction, Bearings, Statistics, Angles of Elevation and Depression, and Transformation in the Cartesian Plane. Overall, result revealed that 13 (65%) out of the 20 topics mathematics used for the study have been perceived as difficult by the students. The findings were in agreement with Adegun and Adegun (2013) who found that students perceived 14 topics out of 20 topics investigated difficult to learn, and also that of Obioma (1989) who discovered that some senior secondary school mathematics teachers perceived some topics difficult to teach. Similarly, the finding is in line with NERD (1994) report which identified 12 topics in mathematics have been perceived difficult.

The findings of the study indicated statistically significant difference in the perceived levels of difficulty of mathematics topics between male and female students. It can, therefore, be concluded that students' perceptions of difficult topics in mathematics were influenced by gender. The finding of this study was consistent with findings of Mutodi and Ngirande

(2014) and Hoang (2008) who showed that male consistently reported slightly more positive perceptions and attitudes than females. It was also in agreement with those of Phillips (2002) and Iyewarun (1985) who found that gender difference influence perception of science concepts. The findings of this study was contrary to those of Li (1999), Idowu (2002) and Oyedeji (1992) who found that gender differences of the teachers do not influence their perception of difficult topics in mathematics at the primary school level. Similarly, a research carried out by Mohamed and Waheed (2011) showed that the students' positive attitude towards mathematics was medium and there was no gender difference in their attitudes.

The last finding revealed that, there was no statistically significant difference on the students perception based on schools' nature. This means that, schools' nature had no influence on students' perceptions of difficult topics in mathematics. On the basis of the findings of this study, it can be concluded that, schools' nature has no influence on students' perceptions of difficult topics in mathematics. The outcome of this study agreed with that of Ibitoye (1990) who found that schools' nature had no influence on students' perception of agricultural science concepts.

## Conclusion and Recommendations

Based on the findings of this research work, it can be concluded that, poor perception of mathematic curriculum can be established as the reason for the poor performance in mathematics.

Generally, it has been established that the performance in mathematics is poor despite the central role mathematics plays in all human endeavours. The poor performance of learners in the subjects has led to wide range of concern and the focus of stake holders to find the lasting solution with the sole aim of improving students' performance in the subject. The implication of this is that the performance of students in the subject will continue to be low if the students' interest, awareness, and/or their personal interpretation regarding mathematics remain unchanged.

Finally for advancement in science and technology education in Nigeria, it is recommended that;

i   Teachers and other stake holders should endeavour to encourage and motivate students to learn mathematics.
ii   Curriculum developers should develop instructions that would improve students' knowledge by laying more emphasis on the perceived difficulty areas in mathematics.
iii   Authors of textbook should shift emphasis from teachers' activities to students' activities that will promote learning by doing.
iv   Further studies should be conducted on perceived levels of difficulty of mathematics topics especially on the factors responsible for the difficulty levels and if there is a relationship between perception and students' achievement.

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