

Exploring Senior Secondary School Students' Perceptions of Mathematics Education: A Cross-Sectional Survey in Katsina State, Nigeria

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Abstract—The aim of this paper is to study students' view on mathematics learning in Katsina State Senior Secondary Schools of Nigeria, such as their conceptions of mathematics, attitudes toward mathematics learning, etc. A questionnaire was administered to a random sample of 1,225 senior secondary two (SS II) students of Katsina State in Nigeria. The data collected showed a clear picture of the hurdles that affect the teaching and learning of mathematics in our schools. Problems such as logistics and operational which include shortage of mathematics teachers, non-availability of a mathematics laboratory, etc. were identified. It also depicted the substantial trends of changing views and attitudes toward mathematics across secondary schools. Students' responses to the conception of mathematics were consistent and they demonstrated some specific characteristics of their views in learning mathematics. This survey has provided useful information regarding students' needs and aspirations in mathematics learning for curriculum planners and frontline teachers for future curriculum reform and implementation.

I. INTRODUCTION

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ATHEMATICS education is the pivot of all sciences.

Achievement of Nigeria's vision 20:2020 therefore is based principally on the successful attainment of the objectives of mathematics education at all levels. The removal of all impediments or problem areas in the achievement of the goals of mathematics education has become imperative at all levels of education so as to maintain the enviable position of mathematics in nation building. [1].

Traditionally, the major emphasis of elementary mathematics has been to teach children arithmetic – addition, subtraction, multiplication and division of whole numbers, fractions, decimals and percentages. But

mathematics involves more than computation. It is the study of patterns and relationships; a science and a way of thinking; an art which is characterized order and internal consistency [2].

Mathematics requires a good foundation, understanding of basic principles of number, logic, clear thinking and the ability to apply what you know to new and unfamiliar situations. The close relationship between students' view on mathematics and their learning of mathematics has been widely recognized. On the other hand, students' experiences in learning mathematics influence the formation of their views [3]. On the other hand, their views or belief affect how they behave in learning

Fahad Suleiman is with the Department of Mathematics & Statistics, Federal Polytechnic Kaura Namoda, Zamfara State, Nigeria (phone: situations, which in turn affect the way they learn mathematics [3].

Reference [3] sees mathematical beliefs as a regulating system which has a prognostic character. In their words, mathematical beliefs form a frame for an individual's knowledge structure which broadly influences the mathematics performance of the individual. For example, when a student sees mathematics merely as calculations, this understanding of the student is often as a result of teacher – dominated learning situation with special emphasis on calculations. In that case, tasks that require a deep level of thinking might be difficult and even impossible for the student. In the present article, we study students' views on mathematics and mathematic learning, including their conception of mathematics, their attitude toward mathematics and their perceived views of the importance of mathematics laboratory in learning mathematics. The findings, we believe, will present an important reflection for the realistic learning situation of the mathematics classroom in Katsina State from the learners' perspective.

To elaborate, we aim at investigating the following in our study:

1. Students' conception on mathematics.
2. Students' attitude toward mathematics learning such as interest, confidence, etc.
3. Students' preference of understanding with regard to the use of mathematics laboratory.

II. METHODOLOGY

A. Sample and Administration

The study was carried out in June 2015. The sample for this study was drawn from 14 randomly selected senior secondary schools in Katsina State. The cluster sampling technique based on the seven education zones in the state was used to select two schools from each education zone to participate in this study.



Reference [4] opined that if the total area of interest happens to be a big one, a convenient way in which a sample can be taken is to divide the area into a number of smaller non-overlapping areas and then to randomly select a number of these smaller areas with the ultimate sample consisting of all units in these small areas or cluster.

Based on the above experts' decision, the researcher decided to select the following schools:

- i. Government College (Pilot) Funtua
- ii. Government Pilot Day Secondary School Bakori
- iii. Government Day Secondary School Danrimi iv. Government Pilot Day Secondary School Dayi
- v. Government Girls Arabic Secondary School Dutsinma
- vi. Government Pilot Secondary School Safana
- vii. Government College (Senior) Katsina
- viii. Government Day Secondary School Jibia
- ix. Government Day Secondary School Muduru
- x. Government Pilot Day Secondary School Mashi
- xi. Government Day Secondary School Kankia
- xii. Government Senior Secondary School Ingawa
- xiii. Government Senior Secondary School Daura
- xiv. Government Day Secondary School Kalgo – Gari

A total of 1,225 students involved in this research were randomly selected from these schools.

TABLE
SAMPLE OF KATSINA STATE SENIOR SECONDARY SCHOOLS STUDENTS ENROLMENT [6]

S/N	School (s)	Boys	Girls	Total	Sample size
1.	GC (P) Funtua	480	-	480	96
2.	GPDSS Bakori	350	234	584	117
3.	GDSS Danrimi	329	141	470	94
4.	GPSS Dayi	197	129	326	65
5.	GGASS Dutsinma	300	-	300	60
6.	GPSS Safana	159	53	212	42
7.	GC (S) Katsina	840	624	1464	293
8.	GDSS Jibia	545	233	778	156
9.	GDSS Muduru	180	37	217	43
10.	GPDSS Mashi	323	-	323	65
11.	GDSS Kankia	138	-	138	28
12.	GSSS Ingawa	168	72	240	48
13.	GSSS Daura	350	-	350	70
14.	GDSS Kalgo – Gari	169	73	242	48
	Total	4528	1596	6124	1225

B. Research Instrument

A questionnaire was designed to contain questions that require simple answers, and were completed anonymously. The main objective of the questionnaire was to study students' conception of mathematics, their attitude toward mathematics and their perceived difficulty in learning mathematics, as well as to identify whether the use of the mathematics laboratory affects or influence students'

performance in learning mathematics in our secondary schools.

C. Validity/Reliability

A pilot study of the questionnaire was conducted on colleagues and other professionals within the reach of the researchers.

III. METHOD OF DATA ANALYSIS AND PRESENTATION

The researcher used the chi-square, which is a statistical measure in the context of sampling analysis for comparing a variance to a theoretical variance. As a non-parametric test, it can be used to determine if categorical data show dependency or the two classifications are independent. It can also be used to make comparisons between theoretical populations and actual data when categories are used. Thus, the chi-square test is applicable in a large number of problems [4].

The above statistical tool also helps the researcher to grade the responses supplied by the respondents. It is also a way that can easily be identified or understood by the beneficiaries/ readers of this research.

The data were presented and analyzed in descriptive statistics which dealt with the results of the questionnaire. The presentation and analysis of the data were done with a view of answering the stated research questions.

A. Research Question

To what extent do you agree or disagree with each of the following statements?

TABLE II
STUDENTS' PERCEPTIONS ON MATHEMATICS LEARNING [6]

S/N	Item	SA	A	D	SD	Total	Remark
1.	Mathematics is Primarily an abstract subject	135 11%	86 7%	330 27%	674 55%	1225 100%	Disagree
2.	Mathematics is primarily a formal way of representing the real world	637 52%	306 25%	208 17%	74 6%	1225 100%	Agree
3.	Mathematics is primarily a practical and structured guide for addressing real situations	882 72%	220 18%	74 6%	49 4%	1225 100%	Agree

Table II indicated that a large percentage of the respondents disagree with the statement in item one i.e. Mathematics is primarily an abstract subject, while a majority of the respondents agreed with statements two and three i.e. Mathematics is primarily a formal way of representing the real world and Mathematics is primarily a practical and structured guide for addressing real situations. This result clearly shows that most of the students are of the opinion that mathematics is primarily a practical and structured guide for addressing real situations and also it is a formal way of representing real situations.

1. Hypothesis I

Students' performance in Mathematics Learning in Katsina State Senior Secondary Schools depends on the use of a Mathematics Laboratory.

TABLE III
STUDENTS' RESPONSES ON THE AVAILABILITY OF MATHEMATICS LABORATORY IN THEIR SCHOOLS [6]

Gender	Yes	No	Total	Df	Decision	
Boys	220 (211.13)	645(653.87)	865	1	1.78	3.84 Accepted
Girls	79 (87.87)	281 (272.13)	360			
Total	299	926	1225			

: Mathematics Laboratory has no effect on Students' performance in learning mathematics in Katsina State Senior Secondary Schools.

TABLE IV

CHI – SQUARE ANALYSIS ON STUDENTS' RESPONSES ON THE AVAILABILITY

OF MATHEMATICS LABORATORY [6]

O	E	O - E	(O - E) ²	$\frac{(O - E)^2}{E}$
220	211.13	8.87	78.68	0.37
645	653.87	-8.87	78.68	0.12
79	87.87	-8.87	78.68	1.00
281	272.13	8.87	78.68	0.29
			TOTAL	1.78

0.05

Chi – square tabulated

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... 3.84

Therefore,

$$X < 3.84$$

Decision Rule

Reject H₀ if $X > 3.84$. Now, 1.78 and 3.84. However, 1.78 < 3.84. Therefore, since

1.78 is less than 3.84, the researcher rejected that Mathematics Laboratory has no effect on Students' performance in learning mathematics in Katsina State Senior Secondary Schools.

2. Hypothesis II

Students' attitude towards mathematics learning in Katsina State Senior Secondary Schools depends on their interest mathematics lessons.

TABLE V

STUDENTS' RESPONSES ON THEIR INTEREST IN MATHEMATICS LESSON [6]

Gender	Yes	No	Total	Df	Decision	
Boys	648 (641.16)	217 (223.84)	865	1	0.98	3.84 Accepted
Girls	260 (266.84)	100 (93.16)	360			
Total	908	317	1225			

TABLE VI

CHI – SQUARE ANALYSIS ON STUDENTS' RESPONSES ON THEIR INTEREST IN MATHEMATICS LESSON [6]

O	E	O - E	(O - E) ²	$\frac{(O - E)^2}{E}$
648	641.16	6.84	46.79	0.07
217	223.84	-6.84	46.79	0.21
260	266.84	-6.84	46.79	0.18
100	93.16	6.84	46.79	0.47
			TOTAL	0.93

0.05

Chi – square tabulated

...

...

... 3.84

Therefore,

$$X < 3.84$$

Decision Rule

Reject H₀ if $X > 3.84$. Now, 0.93 and 3.84. However, 0.93 < 3.84. Therefore, since 0.93 is less than

3.84, the researcher accepted that the students' attitude towards mathematics learning in Katsina State Senior Secondary Schools depends on their interest in the mathematics lessons.

IV. DISCUSSION

The findings of the study reveal a clear picture on how students perceived the concept of mathematics learning, in which most of the students disagreed with item one, i.e. Mathematics is primarily an abstract subject. Another facet of the students' conception of mathematics was that of item two and three, i.e. Mathematics is primarily a formal way of representing the real world and Mathematics is primarily a practical and structured guide for addressing real situations, which were 52% and 72%, respectively, agreed with the strong opinion that mathematics is primarily both a formal way of representing the real world and a practical, structured guide for addressing real situations. That is to say mathematics learning is essential in solving socio-economic problems. Moreover, research findings in the hypothesis one indicates that mathematics laboratories in our schools are of great importance and that government should endeavor to build mathematics laboratories in our secondary schools, since it is a contributing factor for improved performance of the students, especially in learning mathematics. According to the research results, a lack of such laboratories in a school can easily affect the students' performance in mathematics, and therefore, can also have an affect other related science and social science subjects that require mathematical applications.

Hypothesis II shows that students were interested in mathematics lessons which contribute to their positive attitudes toward learning the subject. Among all the students, interest in attending mathematics lessons was not as high as the interest in mathematics itself. They also possessed a very positive attitude not only to their competence, but also to the mismatch of the curriculum in a broader sense. Curriculum developers and teachers should reflect upon whether our intended curriculum (curriculum documents, text books) and our implemented curriculum (including classroom teaching and teaching style) suits the needs of our students and also helps maintain their interest in the subject throughout their schooling. Nevertheless, a lack of qualified mathematics teachers has affected the quality of education in Katsina State. It is a problem that has resulted in the production of students with a poor academic background. According to [5], "The Governor of Katsina State of Nigeria, Aminu Masari, on 1st July, 2015 said his state lacks qualified teachers in two key

subjects: English and Mathematics". Other problems that can working conditions include a lack of teaching materials and some of the problems militating against the development of mathematics education in the state, infrastructure, as well as poor mathematics education in the state.

QUESTIONNAIRE ON STUDENTS' VIEWS ON MATHEMATICS LEARNING

Please answer the following questions by ticking the appropriate box

SECTION A:

GENDER: M F AGE: CLASS:

SCHOOL:

SECTION B:

1. Total number of Senior Secondary Students 2 (SS II):
boys: girls:

2. How many Mathematics teacher(s) do you have in this school?

none 1 2 3 4 5 6 7 8 9 10

3. How many Mathematics period(s) do you have in a week?

1 2 3 4 5 6

4. To what extent do you agree or disagree with each of the following statements?

	Strongly disagree	disagree	Agree	Strongly agree
a) Mathematics is primarily an abstract subject	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Mathematics is primarily a formal way of representing the real world,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Mathematics is primarily a practical and structured guide for addressing real situations,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Do you have Mathematics laboratory in this school?
Yes No

6. If yes, do you use the laboratory for practical mathematics lessons?
Yes No

7. Are you interested in mathematics lessons?
Yes No

Fig. 1 Questionnaire on Students' Views on M

V. RECOMMENDATIONS

- Government shall create an enabling environment for effective teaching and learning mathematics.
- Government shall build mathematics laboratory across state public schools and ensure adequate provision of laboratory equipment.
- Effective supervision and monitoring of the laboratories and other teaching materials shall be maintained periodically.
- Solid foundation should be laid for mathematics subjects by ensuring that only qualified educators teach the subject and that they teach well.
- Teachers shall make the teaching of mathematics more practical
- Teachers shall develop the use of modern techniques, teaching aids and mathematics learning materials.
- Parents shall provide all the necessary mathematics learning materials for their children
- Parents shall encourage the equal learning participation for both girls and boys.
- Students shall engage in focus group studies.

VI. CONCLUSION

The rich data collected in this research offers curriculum planners and frontline teachers a full picture of mathematics education in Katsina State of Nigeria. With this information in hand, curriculum planners and teachers should be able to have better curriculum implementation. In the other hand, there is a pressing need to cater to learner differences and to devise a means to help students with learning difficulties. The research findings help not only educators in the state, but also other states in Nigeria, as well as other countries around the world with similar socio-cultural settings, to understand how students perceive mathematics learning.

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