Strategies for Reshaping Secondary School Students' Attitude towards the Study of Mathematics in Secondary Schools

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ABSTRACT

This research was based on the strategies of changing students' attitude towards the study of mathematics. Questionnaires of twenty items on four point Likert scale with strongly agree, agree, disagree, and strongly disagree were administered to a sample of two hundred (200) students selected from five secondary schools. Four (4) research questions and two (2) hypotheses were used to guide the study. Mean and standard deviations were used as the statistical measure for the research questions while t-test at 0.05 level of significance was used for the hypotheses. The results obtained shows that students will change from their attitude towards the study of mathematics if the factors listed under the summary of finding were given appropriate consideration. This change in the students' attitude will bring about high interest, performance and achievement in the learning of mathematics. Based on the findings, recommendations were made.

Keywords: Strategies, Reshaping, Secondary School, Students, Attitude

INTRODUCTION

Mathematics has spread its tentacles in all parts of the world such that people from different works of life see and appreciate its scope and influence in national and human development. There are many definitions of mathematics. According to the [1] mathematics is a science of structure, order and relation that has evolved from elemental practices of counting, measuring and describing the shape of objects. Mathematics is commonly defined as the study of patterns, structure change and space [2]. More informally, one might say it is the study of "figure and numbers". [3] in his idea and opinion referred to the subject (mathematics) as the Queen of the sciences. Mathematics from our everyday experience has a lot to do with all human endeavours: farming, Engineering, medicine and in the political field. Mathematics is more than algebra-the language of symbols and relations; more than geometry-the study of shape, size and space and it is higher than numerical trigonometry, which measures distance and analysis. It is more involving than statistics-the science of interpreting data and graphs, infinity and limits [4]. At this point, it is necessary to portray the importance of mathematics to people from different spheres of life and in the development of any nation. Mathematics plays an importance role in the domestic life of humanity in every race in the sense that, before a pot of soup could be cooked; we need to know the proportion of water, pepper, salt and other condiments needed for the cooking. A farmer requires a good sense of ratio and estimation to enable him make good use of the number of yams in his barn for a portion of land, and to know exactly the number of labourer needed for the cultivation of the farmland and also the amount it will consume. Mathematics is a suitable subject for calculating the worth of the economy of any nation. It deals with economy of time, money, speech and thought. It is bound to develop the corresponding attitude in the individual. The learning of the act of economical living is a by-product of mathematics. A good knowledge of mathematics is needed to enable one specialize in such courses like medicine, accountancy, computer science and chemistry in the universities and polytechnics. Many students wished to study medicine, nursing and other related science courses

but due to the element of mathematics in such courses, they swerve to the courses, which involved less or no element of mathematics like Igbo and social studies. The above assertion is buttressed by [5] who stressed the importance of mathematics to the pursuit of science and technology and further argues that the gaining of an understanding of it is seriously hampered for the person concerned if he is not mathematically secured.

Statement of the Problem

Mathematics appears to be feared by students. The student's way of studying mathematics should be regarded very seriously, if one wants to make his or her judgment. Mathematics in our schools today are taught and learnt with mixed feelings, coupled with the preconception that mathematics is too difficult to be understood and general poor performance in mathematics. Tests and examinations result have shown this. For instance, in the year 1999, the Imo State Commissioner for Education sadly revealed that more than fifty-one percent (51%) of the students who took the West Africa Examination Council in mathematics failed. The Science Teachers Association of Nigeria held a conference in 1986 and regrettably said that "it is however a well-known fact today that most students who sit for mathematics examination in Nigeria failed" [6]. Also the relationship between mathematics and other field of study provides an important means of stimulating interests. The contribution which mathematics has made to the understanding of many subjects are recognized fully in economics, physics, chemistry and geology. Such things can notice students' attitude towards mathematics they do to boycott mathematics class and consider the teacher as their enemy as long as he or she remains the mathematics teacher. [7]. Therefore, the problem of this study is to find out the strategies that could be used to instill a positive attitude in students learning of mathematics.

RESEARCH METHODOLOGY

Design of the Study

[8] stressed that a research design is a plan, which specifies how data relating to a specific problem should be collected and analyzed. The research design for this work is descriptive survey research design, which is used to investigate a condition or to learn the status of something to show pattern of distribution of the items of the population [9]. Survey is an investigation of the opinions, behaviour, and so on of a particular group of people, which is usually done by asking them some questions.

Area of the Study

This study was carried out in Obowo Local Government Area of Imo State. The Local government is made up of fifteen district communities and fifteen secondary schools, which include co-education, boy's high school and girl's high schools.

Population of the Study

[10] defined population as a well-defined set of all elements to which the findings and conclusions of a particular study relates. Population of the study has to do with the groups of elements, objects or members from which the researcher intends to collect data pertinent to her research. The population of this study comprised all the junior secondary school three (3) students in Obowo Local Government Area of Imo State. They are six hundred in number (600) from eight co-education and seven single sexed schools. The information gathered from these secondary schools were used to answer effectively questions relating to the strategies, which can be used to change students' attitude towards mathematics.

Sample and Sampling Techniques

Sampling according to [11] is the means of selecting a limited number of elements from a defined population as representative of that population. The sample consisted of two hundred (200) JSS 111 students from five (5) randomly selected secondary schools in Obowo Local Government Area. In each of the selected schools, forty (40) students in the junior secondary school class three students were used for the study. A

sampling technique should be seen as a plan specifying how they (population) will be drawn [12]. The sampling technique used was the simple random sampling in which all the students in the sampled schools have equal chances of being selected. Random Sampling refers to the method or procedure of selection of a sample in such a way that all the individuals in as defined population have equal and independent chances of being selected. This implies that the selection of one individual does not affect in anyway the selection of any other individuals, [13]. These schools were stratified into three (3): co-education, a boy's and a girl's only secondary school. Two hundred (200) students were then selected by simple random sampling and used for the study as sample.

Breakdown of Schools and Sex

S/N	SEX	NAMES OF SCHOOLS
1	Boys and Girls	Secondary Technical school Achara Obowo
2.	Boys and Girls	Secondary Technical school Avutu Obowo
3.	Boys and Girls	Secondary Technical school Umuariam Obowo
4.	Boys only	Boys High School Ikenanziz Obowo
5.	Girls only	Girls High School Amuzi Obowo

Instrument Used for Data Collection

The instrument used for this study was the questionnaire on the strategies for changing students attitude towards the study of mathematics. It was constructed and structured by the researcher in the format of strongly agreed, agreed, disagreed, and strongly disagreed. The items of the questionnaires were specially designed to investigate the strategies for changing student's attitude towards the study of mathematics. The questionnaire which is made up of twenty (20) items was designed in such a way that each respondent would have to freely respond according to his or her personal opinion by simply ticking (V) in the appropriate box provided.

Validation of the Instrument

[14] stressed that the validity of an instrument is the extent an instrument measures what it is designed to measure, in the validation of the instrument used, my supervisor and a lecturer all in the department of science and computer Education in Ebonyi State University, Abakaliki face validated the instrument before they were administered. The experts applied their wealth of knowledge to validate the questionnaire items, made corrections and suggestions. Their views formed the basis for the validation of the instrument.

The Reliability of Instrument

Reliability according to [15] refers to the degree of consistency with which a measuring instrument measures whatever it is measuring. After the face validation, the items numbered twenty (20) were subjected to a reliability construct using Crombach Alpha. The coefficient of the reliability was found to be 0.80, which implies internal consistency.

Administration of Instrument

The researcher used face-to-face method of administration to administer the instrument in the five selected schools with the help of two friends. The questionnaires were completely filled on the spot and retrieved. This ensured a hundred percent return.

Method of Data Analysis

The data collected were converted to frequencies. Mean and standard deviations were used to analyze the research questions while t-test was used

to test the hypotheses. The mean were computer by multiplying the frequency of the responses under such category by the assigned nominal value and dividing the sum of the product by the number of respondents to the particular item. The following response formula was applied.

$$\overline{X} = \frac{\sum X}{N}$$

Where X = mean

N = Number of respondents

$\sum$ = Summation

X = Nominal Value

The cutoff point was calculated by adding the nominal value of the weights (which gave total of 10) divided by the number of opinion option (i.e. 4).

Number of scaling items

$$= \frac{4+3+2+1}{4} = 2.5$$

When the mean is greater than 2.5, it implies that majority agreed to the item statement in the questionnaire. But if the mean is less than 2.5, it indicates that majority of respondents disagreed with the particular statement item referred to in the instrument

PRESENTATION OF RESULTS
RESEARCH QUESTION ONE

To what extent does the attitude of the teacher affect students' attitude to mathematics?

Table 1

S/N	ITEMS	MEAN	SD	DECISION
1	I hate mathematics because my teacher calls me names	1.87	0.82	Rejected
2.	My teacher helps us solve mathematics problem outside mathematics class.	3.52	0.53	Accepted
3.	My teacher gives assignment in mathematics class outside what he taught in classroom.	2.60	1.11	Accepted
4.	My teacher encourages me to do mathematics problems on my own.	2.57	1.09	Accepted
5.	I enjoy mathematics class because my teacher is very good mathematics teacher.	2,62	1.05	Accepted
	Average Mean	**2.6**	**0.78**	

Based on the results in table 1 above, the average mean for all the items is 2.6 with a standard deviation of 0.92. This is more than 2.5 cut of point; hence the respondents agree that teacher's attitude affects students' attitude in learning mathematics.

RESEARCH QUESTION TWO

How far does the use of instructional material increase students' retention in mathematics?

Table 2

S/N	ITEMS	MEAN	STD. DEV.	DECISION
6.	Use of teaching materials makes mathematics enjoyable.	2.56	1.05	Accepted
7.	I understand mathematics better with the use of teaching aids	2.66	1.08	Accepted
8.	My teacher uses many instructional materials during mathematics class.	2.50	1.05	Accepted
9.	My teacher is resourceful in improvising instructional materials for teaching mathematics.	2.62	1.04	Accepted
10.	My teacher is careful in using instructional materials.	2.59	1.09	Accepted
	Average Mean	**2.5**	**1.06**	

The results in table 2 above, shows that the average mean for all the items is 2.5 with a standard deviation of 1.06. This is also more than 2.5 cut of point implying that the use of instructional materials increases students' retention in mathematics lessons.

RESEARCH QUESTION THREE

To what extent does the school and classroom environment affect the interest of students in mathematics?

Table 3

S/N	ITEMS	MEAN	STD DEV	DECISION
11.	We have enough classrooms for teaching mathematics.	2.49	1.05	Accepted
12.	Our classrooms are well ventilated for teaching.	2.56	0.99	Accepted
13.	Our schools are located in a quiet environment.	2.49	0.96	Accepted
14.	We have enough space in our classroom.	2.44	1.17	Accepted
15.	Our mathematics class does not experience crowded situation.	2.61	1.10	Accepted
	Average Mean	**2.5**	**1.05**	

Considering the results in table 3 above, the average mean for all the items is 2.5 with a standard deviation of 1.05. This is above 2;5 cut of point for rejection or acceptance; hence the respondents agree that school and classroom environment affect the interest of the students in learning mathematics.

Research Question Four

To what extent does the time of teaching affect students understanding of mathematics?

Table 4

S/N	ITEMS	MEAN	STD DEV	DECISION
16,	We have enough time allocated for mathematics.	2.61	0.98	Accepted
17.	(Learn mathematics best during morning period.)	2.67	1.03	Accepted
18.	Mathematics can be done interestingly for any number of hours.	2.44	1,08	Accepted
19.	Period of the day (morning or afternoon) does not necessarily affect mathematics lesson.	3.52	0.53	Accepted
20.	Mathematics teacher does uses his lesson period completely	2.57	1.11	Accepted
	Average Mean	**2.7**	**0.94**	

Based on the results in table 4 above, the average mean for all the items is 2.7 with a standard deviation of 0.94. This is more *t* than 2.5 cut of point; hence the respondents agree that the duration of teaching affects the learning of mathematics.

HYPOTHESIS ONE

There is no significant difference between the mean attitudinal responses of boys and girls in mathematics.

Table 5: t-test on Attitude of Students Based on Gender

S/n	Variable	N	X	S.D	df	t-cal	t-crit	Significant
1.	Male	89	2.29	0.93	198	7.37	1.96	Signif.(S)
	Female	111	1.53	0.50				
2.	Male	89	3.50	0.54	198	-0.34	1.96	NS
	Female	111	3.53	0.51				
3.	Male	89	2.51	1.15	198	-1.08	1.96	NS
	Female	111	2.68	1.08				
4	Male	89	2.58	1.11	198	0.11	1.96	NS
	Female	111	2.56	1.06				
5.	Male	89	2.49	1.06	198	-1.52	1.96	NS
	Female	111	2.72	1.03				
	Total 4. 54/20=0.227						1.96	NS

Decision Rule: Reject the null hypothesis when the critical value of the t-test is less than the calculated t. Accept the alternative hypothesis when the calculated t-test is less than the critical t. Determination of the degree of freedom and critical value of the test statistics in t-test, the degree of freedom formula is $(n_1 + n_2) - 2 = (89 + 111) - 2 = 200 - 2 = 198$. The critical distribution table of the t-test at df=198 under 0.05 for the 2 tailed is 1.96. Since the critical value is greater than the calculated value at alpha 0.05 the null hypothesis is accepted. This implies that there is no significant difference between the attitude of boys and girls in mathematics.

Hypothesis Two

HO_2: There is no, significant different between the mean attitude responses of students in co-education and students in single sex.

Table 2: t-test on Co-education and Single sex schools

S/n	Variable	N	X	S.D	Df	t-cal	t-crit	Significant
1.	Co-educ	119	1.69	0.64	198	-3.73	1.96	NS
	Single sex	81	2.12	0.97				
2.	Co-educ	119	3.53	0.51	198	0.66	1.96	NS
	Single sex	81	3.48	0.55				
3.	Co-educ	119	2.63	1.12	198	0.55	1.96	NS
	Single sex	81	2.55	1.10				
4	Co-educ	119	2.50	1.05	198	-1.17	1.96	NS
	Single sex	81	2.68	1.13				
5.	Co-educ	119	2.68	1.05	198	1.02	1.96	NS
	Single sex	81	2.52	1.04				
		Total -2.67/20				-0.133		NS

Decision Rule: reject the null hypothesis when the calculated value of t is greater than the critical value of t. Accept the null hypothesis when the calculated value of t is less than the critical value. Based on Formula for degree of freedom in t-test is $(n_1 + n_2) -2 = (119 + 81) - 2 = 200 - 2 = 198$. Having known the degree of freedom, then the table of critical distribution of the t-test at degree of freedom 198 under 0.05 for two tailed is 1.96. Since the calculated value is less than the critical value at alpha 0.05 we accept the null hypothesis. This means that there is no significant different between the mean attitude students in coeducational schools and students in single sexed schools.

Summary of Findings

In table one, the first item has its mean to be 1.87 and standard deviation of 0.82 this shows that their teachers do not call them (students) names in the classroom

while teaching. The second item has its mean to be 3.52 and standard deviation of 0.53, which indicate that their teacher renders help to them in solving mathematics problems outside mathematics class. The mean of the third item is 2.60 and standard deviation of 1.11 this means that the teacher in mathematics does not give assignment on what she taught. The fourth item has 2.57 and standard deviation of 1.09 it shows that their teacher encourages them to do mathematics problem on their own. The fifth item has its mean to be 2.62 and standard deviation of1.05 this shows that they have a good mathematics teacher. Table two first item has its mean to be 2.56 and standard deviation of 1.05 which shows that the use of instructional materials make mathematics class enjoyable. The second item has its mean to be 2.66 and standard deviation of 1.08 indicating that students understand mathematics better with the use of teaching aids. The third item has the mean of 2.50 and standard deviation of1.05, which indicate that the mathematics teacher uses many instructional materials during mathematics lessons. The fourth item has its mean to be 2.62 and standard deviation of 1.04, which means their mathematics teacher, is resourceful in improvising instructional materials for mathematics. The last item has its mean to be 2.59, which shows that the mathematics teacher is careful in using instructional materials. In the table three, the first item has its mean to be 2.49 and standard deviation of 1.05, which shows that they have enough classrooms for teaching mathematics. The second item has its mean to be 2.56 and standard deviation of 0.99, which indicate that they

have well ventilated classroom for teaching of mathematics. The third item has its mean to be 2.49 and standard deviation of 0.96, which shows that their school is located at a quiet area. The fourth item has its mean to be 2.44 and standard deviation of 1.17 this shows that there is enough space in their classroom, the fifth item has its mean to be 2.61 it indicates that their mathematics class does not experience crowded situation. The fourth table first item has its mean to be 2.61 and standard deviation of 0.98, it shows that enough time is allocated for teaching of mathematics in their schools. The next item has its mean to be 2.67 and standard deviation of 1.03 it shows that they learn mathematics best in the morning period. The third item has its mean to be 2.44 and standard deviation of 1.08, which indicates that mathematics, can be done interestingly for any number of hours. The fourth item has its mean to be 3.52 and standard deviation of 0.53 which shows that the period of teaching Mathematics does not affect mathematics lesson. In the fifth item, the mean is 2.57 and standard deviation of 1.11 and this shows that their mathematics teachers do not miss their lesson period in mathematics because they like mathematics. Based on the result on table 5 the teal is less than tcrit, therefore the null hypothesis one is accepted, which implies that there is no significant difference between the mean attitudinal responses of boys and girls in mathematics. Also in table 6 the teal is less than the tcrit for this reason, the null hypotheses is accepted. This implies that there is no significant difference between the attitude mean of students in co-educational and students in single sexed schools.

DISCUSSION

Research Question One

To what extent does the attitude of teacher affect student's attitudes to mathematics?

According to the response of students in junior secondary schools in the sampled schools, it was noticed that their teachers do not call them names in the classroom

while teaching. Their response also shows that their mathematics teachers help them in solving mathematics problem outside the mathematics class and do give assignment outside what he taught in the classroom. The mathematics teachers give them free hand in solving mathematics problem on their, own. The students' response shows that they enjoy

mathematics class because they have a very good mathematics teacher.

Research Question Two

To what extent does the use of instructional materials increase students' retention in mathematics? The study revealed that the use of instructional materials make mathematics enjoyable also that the students understand mathematics better with the use of teaching aids. This shows that mathematics teachers should make proper use of the instructional materials because they make the students to develop positive attitude towards mathematics. The researcher found out that some of the mathematics teachers do use instructional materials in teaching of mathematics. The study also revealed that their teachers are resourceful in improvising instructional materials for teaching mathematics and are very careful in using instructional materials (that is, using instructional materials that relate to the topic being taught)

Research Question Three

To what extent does the school and classroom environment affect the interest of students in mathematics? The response shows that there are enough classrooms for teaching mathematics. Also that they>have ventilated classroom most schools are located at quiet environment all these contribute to induce positive students attitude in mathematics. It equally revealed that they have enough space in their classroom and do not experience crowded situation.

Research Question Four

To what extent does the time of teaching affect students understanding of mathematics?

The responses show that enough time is allocated for mathematics lesson. It equally revealed that mathematics is understood best in the morning period. The students' responses show that mathematics can be done interestingly for any number of hours. Also period of the day (morning or afternoon) does not affect mathematics lesson. The students accepted that their mathematics teachers do not miss their mathematics lesson period because they have interest in mathematics. In the research hypothesis one; there is no significant difference between the mean attitudinal of boys and girls in mathematics. The decision was based on rejecting the null hypothesis and accepting the alternative when the calculated value is greater than the critical value but if it is otherwise the null hypothesis is accepted. From the result obtained the critical value is greater than the calculated value at alpha 0.05 level of significant. While in research question two there is no significant difference between the mean attitude of students in co-education and students is single sex, because the calculated value is less than the critical value at alpha 0.05 this resulted in accepting the null hypothesis.

Educational Implications

The study revealed that students are not interested in learning of mathematics because of a lot of factors militating against their interest. These factors, which affect their attitude towards the learning of mathematics, are;

i.   Not calling of names by the teacher
ii.   Lack of instructional materials
iii. Lack of classroom and
iv.   Noisy environment

The consequences of these listed factors are that if teachers do not stop calling their students names, reinforce them (students) and so on, the students according to their responses will never develop positive attitude towards the learning of mathematics and these will result to poor academic achievement in mathematics.

RECOMMENDATIONS

Following the findings of this study, the researcher makes the following recommendations: The educational authority should pay attention to the training of teachers through short course; frequent workshop, seminars to the teachers in the field of mathematics. This will acquaint the teachers on the need to use variety of strategies in teaching of mathematics lesson in order to achieve its aims and objectives. Government should provide adequate fund for the supply of

instructional materials for mathematics just as was for some other pure sciences. Teachers should reinforce their students positively because this will help them immensely to participate in the class and other necessary things needed for improvement in mathematics. They should also show interest in mathematics because it will help the students in developing positive attitude towards the study of mathematics. If all these recommendations are tackled or followed as expected, by the teachers and the educational authorities, the attitude of students towards the study of mathematics must surely change.

CONCLUSION

In attempt to find out the strategies of changing students' attitude towards the study of mathematics, the method used in collecting data was questionnaire. The sample consists of two hundred (200) students from the five sampled secondary schools in Obowo Local Government Area of Imo State. The questionnaire consists of twenty (20) items each was completed by the students. The research shows that if students are motivated, their attitude towards any task is affected. This helps in creating positive attitude in students learning of mathematics. Teachers using variety of teaching methods can achieve this. Students should be exposed to federal and state mathematics competitions as well as mathematics quizzes organized by different schools. If all the recommendations and suggestions made are followed, there is hope that there must be a positive change in student's attitude towards the learning of mathematics.

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