

Reducing Mathemaphobia and Improving Students' Achievement in Mathematics Using Constructivist Approach in Abia State Nigeria

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Abstract: *The study investigated reducing Mathemaphobia and improving students' achievement in Mathematics using constructivist approach in Abia State, Nigeria. The study adopted a mixed research design which involved a descriptive survey design and a quasi-experimental of pre-test, post test and control group design. Seven research questions were posed and answered and three hypothesis were formulated and tested at 0.05 level of significance. The population comprised all the 8,325 junior secondary school students in Abia State. A sample of 833 Junior Secondary School students was used for the descriptive survey selected through simple random techniques and a sample of 174 Junior Secondary School students was used for the experimental groups selected through stratified random sampling technique. The instruments for data collection were a questionnaire titled Student Opinion of Mathemaphobia Questionnaire (SOMQ) and Mathematics Achievement Test (MAT). The instruments were validated by five experts and the reliability indices of the instruments were 0.92 and 0.71 respectively. Mean and standard deviation were used to answer the research questions, while analysis of covariance was used to test the hypotheses at 0.05 level of significance. The findings revealed that Junior Secondary School students agreed that Mathemaphobia exist in secondary schools, the study equally revealed that the causes of Mathemaphobia include; poor foundation in Mathematics, improper teaching of Mathematics, low self-esteem, and unqualified Mathematics teachers. The study identified the effects of Mathemaphobia as poor performance in Mathematics and other Mathematics related subjects, hinders admission into higher institutions, poor logical and critical thinking. The finding revealed the strategic measures to reduce Mathemaphobia as establishment of Mathematics club in schools, building Mathematics confidence in students and making Mathematics teaching and learning activity-oriented and learner-centered. The study recommended among others that Mathematics club should be established in schools, Mathematics teachers should be encouraged to attend conferences, seminar and workshops to upgrade and update their knowledge and only qualified Mathematics teachers should be allowed to teach Mathematics in schools.*

Keywords: *Mathematics, Mathemaphobia, Achievement and Constructivist*

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I. Introduction

Mathematics is a subject designed to equip individuals with the basic mathematical knowledge, skills, values and attitudes essential for proper functioning in the society. According to Onuoha-chidiebere (2013:214) Mathematics is a dynamic field of knowledge which has much to offer to science, technology, arts and everyday living. It is a broad and unique field of knowledge that enables individuals to develop the mathematical potentials in them. Ukpebor (2005:91) observed that "for any individual to participate adequately in the world of changing economy and technology, he/she must be balanced mathematically". This simply means that for an individual to participate actively and function effectively in any given society, he/she requires the knowledge or skills of Mathematics. Iji (2007) maintained that any country that aspires for national growth in science, industry and technology must not neglect Mathematics.

The Federal Republic of Nigeria, National Policy on Education (FRN, 2013) identified Mathematics as one of the core and compulsory subjects that every child must offer in primary and secondary education levels. This is as a result of multidimensional values of Mathematics in virtually all facets of human development and experiences. Failure on the part of the students to acquire mathematical knowledge and skills may hamper the attainment of success in examination, achievement of educational goals as well as advancement in science and technology.

It is disheartening to note that the performance of students in Mathematics is poor and unimpressive. Despite the efforts of many organizations such as Mathematics Association of Nigeria (MAN), Science

Teachers Association of Nigeria (STAN) to make Mathematics relevant and more attractive to students, there have not been remarkable change in students achievement in internal and external examinations (Ogbonna, 2013). Table 1 illustrates five years Mathematics performance of students in West African Senior Secondary Certificate Examination (WASSCE, 2012-2016) respectively. The five years with their percentage of credit and above include 2012 (49.00%); 2013 (36.00%); 2014 (31.30%); 2015 (34.18%) and 2016 (38.68%). The mean percentage of candidates that attain A1-C6 from 2012-2016 was 37.83%. This means that the performance of students were poor in the subject. This problem has been of concern to government, stakeholders, scholars, teachers and even parents because of the significant role that Mathematics plays to an individual and the larger society.

Mathemaphobia is regarded as Mathematics weakness in students. Mathemaphobia is equally known as Mathematics anxiety. According to Oyegoke, Oyelabi and Nnaji (2016), Mathemaphobia can be viewed as the feeling of fear, avoidance and dread when dealing with any situation relating to Mathematics. It is feelings of tension and anxiety that appears when someone is engaged in the manipulation of figures to solve mathematical problem in academic and daily life situations. It deals with the psychological dimension of learning. The word "phobia" means fear, panic or terror which originated from the Greek word "phobus". Phobia is the anxiety or fear disorder which causes avoidance and panic. Sloan (2002) described Mathemaphobia as caused by personality characteristics, negative attitudes towards Mathematics; Mathematical avoidance, poor mathematical background, poor teaching behavior, lack of confidence and achievement level and negative experiences in schools. According to Ojimba (2013), Mathematics performance of students at various levels have declined over the years with that of Nigerian students quite remarkable. There is need to re-orient the students' mindset on this subject (Mathematics). The researchers intends to integrate innovative approach that is activity-oriented and learner-centered to ascertain if there may be any remarkable improvement in students achievement in Mathematics and equally reduce Mathemaphobia among students. The innovative approach involved is constructivist approach.

Constructivism is "a theory of learning based on the idea that knowledge is constructed in the human mind when information comes in contact with the existing knowledge that had been developed by experiences" (Wikipedia 2019:1). According to Ogbonna (2013), constructivist is based on the idea that knowledge is constructed by the knower based on mental ability. Constructivist approach stands that learning comes upon knowledge that a student already knows. It is a situation in which learners are being allowed to construct their own knowledge based on their experiences and relate the knowledge to the new situation. Constructivist approach is also regarded as "guided discovery". The teacher makes the classroom conducive for learners to discover facts, knowledge and acquire skills and values themselves.

Academic achievement is the measurement of students' success in academic setting. According to Amara, Garrison and Klentschy (2002), academic achievement is the relative positions of students learning outcomes to a set objectives. To Agbaola and Oyemedede (2007), academic achievement is the gain in knowledge of students as a result of taking part in learning programme. In fact, it is a result-oriented construct that explains the extent of a performance of desired tasks. Academic achievement can be measured in several ways such as assignments, projects, test (oral, written or aptitude tests and examinations).

Generally, gender and location are determinants of human construct and behavior. Gender is defined as socially constructed roles, relationships and learned behavior of male and female. Okeke (2007) defined gender as socially/culturally constructed characteristics and roles which are ascribed to males and females in the society. Onyeizugbo (2000) observed that as far as intellectual function is concerned, men and women stand on equal footing. This means that both men and women have great impact to make in socio-economic development.

Location is a particular point or place in physical space. It is a place where one is living. Location can be in urban or rural. The location of students affects their general performance. Some studies have been carried out on Mathemaphobia and academic achievement in Mathematics. Khatoon and Mahmood (2010) conducted a study on Mathematics anxiety among secondary school students in India and its relationship to achievement in Mathematics and found that Mathematics anxiety is strongly related to learners' achievement.

According to Emenalo (2006), causes of Mathematics phobia include introduction of modern mathematics, poor system of examination, lack of effective teaching aids, shortage of qualified Mathematics teachers, lack of adequate in-service training programme, lack of proper incentive, and an inherent fear of Mathematics. Nunez-Penaab and Bonoab (2013) identified the effects of Mathematics anxiety as follows, low examination grades, negative attitude to Mathematics, lack of interest in Mathematics and low performance in the subject. According to Kaur (2017), the measures to reduce Mathematics phobia include providing of special training to Mathematics teachers, appointing sufficient qualified Mathematics teachers, providing Mathematics laboratories, introducing practical classes in Mathematics, establishing mathematics club, holding discussions regarding importance and application of Mathematics, organizing Mathematics quiz and competitions, building confidence about oneself in Mathematics.

Some studies equally have been carried out on constructivist approach such as Ogunkunle (2007) who conducted a study on effect of gender difference and students' achievement in Mathematics using constructivist and non-constructivist group and she found that constructivist group performed better than non-constructivist group in Mathematics achievement. She equally found that gender is not a significant factor in students achievement in Mathematics. Ogbonna (2013) rightly observed that constructivist approach enhanced students' achievement and retention in Mathematics. Okoroafor (2007) found that students taught with constructivist approach performed better than those taught, with lecture. She equally identified that gender and location are not significant factors to students' achievement. The need to make Mathematics attractive and students' friendly in order to reduce Mathemaphobia and improve students' achievement becomes imperative. To the best of this study, there have not been enough empirical studies on reducing Mathemaphobia and improving students' achievement in Mathematics using constructivist approach in Abia State, Nigeria. The study intends to ascertain the following: Mathemaphobia existence among secondary school students in Abia State, causes and effects of Mathemaphobia, strategic measures to reduce Mathemaphobia, effect of constructivist approach on students' achievement and effects of gender and location on students achievement in Mathematics using constructivist approach in Abia State.

The following research questions are posed to guide the study.

1. To what extent does Mathemaphobia exist among secondary school students in Abia State?
2. What are the causes of Mathemaphobia among secondary school students in Abia State?
3. What are the effects of Mathemaphobia among secondary school students in Abia State?
4. What are the strategic measures to reduce Mathemaphobia among secondary school students in Abia State?
5. What difference exists in the mean achievement scores of students taught Mathematics using constructivist approach and those taught using lecture method?
6. What difference exists in the mean achievement scores of male and female students taught Mathematics using constructivist approach?
7. What difference exists in the mean achievement scores of urban and rural students taught Mathematics using constructivist approach?

Three hypotheses were formulated and tested at 0.05 level of significance.

Ho₁: There is no significant difference between the mean achievement scores of students taught Mathematics using constructivist approach and those taught using lecture method.

Ho₂: There is no significant difference between the mean achievement scores of male and female students taught Mathematics using constructivist approach

Ho₃: There is no significant difference between the mean achievement scores of urban and rural students taught Mathematics using constructivist approach.

II. Methods

The area of the study is Abia State. Abia State is one of the states in South East Geopolitical Zone of Nigeria. The study was carried out using mixed research design which involved a descriptive survey as well as a quasi-experimental design using pre-test, post test and control group design, the quasi-experimental adopted a 2 x 2 x 2 factorial design. The population of the study comprised 8325 Junior Secondary Two (JS2) students made up of 3945 male and 4380 female students at the time of the study in Abia State, Nigeria. A sample of 833 Junior Secondary Two (JS2) was randomly selected from the three education zones of Abia State through simple random sampling technique for the descriptive survey, while a sample of 174 Junior Secondary Two Students was selected through stratified random sampling technique for the experimental groups. Two instruments include used for data collection. The instruments are a questionnaire titled "Students Opinion on Mathemaphobia Questionnaire (SOMQ)" and "Mathematics Achievement Test" (MAT). SOMQ and MAT were developed by the researchers based on extensive literature review. SOMQ consisted of two sections A and B. section A was used to elicit information on the personal data of the students, while section B was made up of 34 items used to gather information on Mathemaphobia existence, causes and effects of Mathemaphobia and strategic measures to reduce Mathemaphobia among students. The questionnaire was structured on Four Point Likert Scale of Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VHE) for Mathemaphobia existence and Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) causes effects and static measures. MAT consisted of 50 multiple choice questions with five options (lettered A to E) in each of which only one option was the correct answer. The test items were derived from Junior Secondary Two Mathematics curriculum and four topics. The lesson plans were prepared based on the four topics within the Mathematics content. A table of specification was constructed to guide in the allocation of questions into cognitive learning outcomes. SOMQ and MAT were presented to two Mathematics teachers, three experts in measurement and evaluation, curriculum and psychology respectively for validation. The reliability of SOMQ and MAT were 0.92 and 0.71 using Cronbach Alpha and Pearson Product Moment Correlation Coefficient respectively. The researchers administered the instruments to 833 students with the help

of five research assistants and informants. They were completed and returned for data analysis. The teaching with constructivist approach was carried out by the researcher and trained Mathematics teachers. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance was used to test the null hypotheses at 0.05 level of significance. The following real limits of numbers were used for decision. Mean score of 3.50-4.00 Very High Extent/Strongly agree, 2.50-3.49 – High Extent/Agreed, 1.50-2.49 Low Extent/Disagree and 0.50-1.49 Very Low Extent/Strongly Disagreed.

III. Results

The results of the study are presented in the tables according to research questions and hypotheses formulated. Data presented in Table 2 reveals that Junior Secondary Two Students are of high extent that Mathemaphobia exists among secondary school students. Results shows that item 1,3,5,6,7 and 8 have mean scores which fall within mean range of 2.50-3.49 indicating high extent with Mathemaphobia existence among Secondary School students in Abia State. The grand mean of 2.75 further affirms the fact that Mathemaphobia exists among secondary school students. The data in table 1 suggested that students have fear of Mathematics in secondary schools in Abia state. Data presented in Table 3 reveals that item 10-19 have mean scores which fall within the mean range of 2.50-3.49 indicating agreed. The grand mean of 2.99 further indicates the fact that students agreed with items 10-19 as causes of Mathemaphobia. This means that the students agreed that the causes of Mathemaphobia include poor foundation in Mathematics, improper teaching of Mathematics content, low self-esteem, difficult content/concepts, lack of teaching and learning facilities, materials and infrastructure, high expectation on Mathematics, family background, lack of immediate satisfaction, unqualified mathematics teachers and inherent fear of Mathematics.

Data presented in Table 4 reveals that items 20-26 have mean scores which fall with the mean range of 2.50-3.49 indicating that students agreed with all the items identified as the effects of Mathemaphobia. The grand mean of 3.01 further revealed that students agreed that the effects of Mathemaphobia include poor performance in Mathematics and Mathematics related subjects, hinders admission into higher institutions, poor logical and critical thinking, inadequate day to day mathematical transaction, lack of interest in Mathematics, negative attitudes towards Mathematics and lack of confidence on students. Data presented in Table 5 shows that items 27-34 have mean scores which fall within the mean range of 2.50-3.49 indicating that students agreed with the strategic measures identified to reduce Mathemaphobia. The grand mean of 2.96 further stresses that students agreed with the following strategic measures; building of mathematics confidence on students, providing of motivational and regular reinforcement, establishment of standard Mathematics laboratories in schools, making Mathematics teaching and learning activity-oriented and learner-centered, establishment of Mathematics club, teaching Mathematics with mnemonics and funs, and providing of adequate facilities, materials and infrastructure.

Table 6 revealed that the experimental group (constructivist approach) pre-test mean achievement score was 25.93 with a standard deviation of 4.74. The control group had pre-test mean achievement test of 9.32. the post-test mean achievement score of the experimental group (constructivist approach) was 58.67 with a standard deviation of 13.08, while the control group was 42.80 with a standard deviation of 10.87. The mean difference of 13.84 was in favour of the experimental group (constructivist approach). This means that experimental group performed better than the control group. Table 7 revealed that the pre test mean achievement score of male students in experimental group was 28.89 with a standard deviation of 5.36 while that of their female counterparts in the same group was 29.64 with a standard deviation of 7.11. The post test mean achievement score of male students in experimental group was 57.82 with a standard deviation of 13.34, while that of female students in the same group was 59.51 with a standard deviation of 12.96. the mean difference was 0.94.

Table 8 showed that the overall pre-test mean achievement scores of urban students taught with constructivist approach was 29.94 with a standard deviation of 5.12 while the pre-test mean achievement score of rural students was 28.42 with a standard deviation of 7.45. the post-test mean achievement score of urban students was 59.52 with a standard deviation of 12.33, while the post test mean achievement score of rural students was 57.60 with a standard deviation of 14.06. The mean difference was 0.41. Table 9 showed that calculated F-value was 55.41 while $F_p(1,172)$ was 3.84. The calculated F-value was greater than the F-critical value of 3.89 at 0.05 level of significance and numerator/denominator degree of freedom of 1 and 172 respectively. Since the F-calculated value was greater than the F-critical value, the null hypothesis was rejected. This means that there was a significant difference between the mean achievement scores of students taught Mathematics using constructivist approach and those taught using lecture method.

Table 10 indicated that the F-calculated value was 0.21 and F-critical value was 3.96 at 0.05 level of significance and numerator/denominator of 1 and 88 respectively. Thus, the F-calculated value was less than the F-critical value, hence the null hypothesis was accepted. This means that there is no significant difference between the mean achievement scores of male and female students taught Mathematics using Constructivist Approach.

Table 11 revealed that F-calculated value was 0.14 and F-critical value was 3.96 at 0.05 level of significance and numerator/denominator of 1 and 88 respectively. This indicated that F-calculated value was less than F-critical value. The null hypothesis was accepted. This means there is no significant difference between urban and rural students taught Mathematics using constructivist approach.

IV. Discussion

The findings revealed that Mathemaphobia exists among secondary school students in Abia State. This can equally hinder their performance in Mathematics. The finding is in line with the findings of Khatoon and Mahmood (2010) who found that Mathematics anxiety is strongly related to students achievement in Mathematics. The findings further revealed that the causes of Mathemaphobia are poor foundation in Mathematics, improper teaching and learning of Mathematics, difficult content/concepts, lack of teaching and learning materials, high expectation on Mathematics, lack of adequate in-service training, lack of proper incentive, shortage of qualified Mathematics teachers and inherent fear of Mathematics. The finding agreed with the findings of Emenalo (2006) who identified the causes of Mathematics phobia as follows, lack of effective teaching aid, shortage of qualified Mathematics teachers, lack of adequate in-service training and inherent fear of Mathematics.

The finding revealed that the effects of Mathemaphobia include poor performance in Mathematics, inadequate admission into higher institutions, poor logical and critical thinking, inadequate day-to-day Mathematical transaction, lack of interest in Mathematics, negative attitudes towards Mathematics and lack of confidence on students. The finding agreed with Nunez-Denaab and Bonoab (2013) who found the effects of Mathematics anxiety as low examination grades, negative attitudes, lack of interest and low performance in Mathematics. The finding further revealed the strategic measures to reduce Mathemaphobia as building of Mathematics confidence on students, providing of motivational and regular positive reinforcement, establishing of standard Mathematics laboratories, making Mathematics teaching and learning activity-oriented and learner-centered, establishing of Mathematics club in schools, teaching Mathematics with mnemonics, quiz competitions, facilities and materials, and introduction of practical classes on Mathematics. The findings agreed with the findings as Kaur (2017) who found that the measures to reduce Mathematics anxiety to include providing of special training to Mathematics teachers, appointing sufficient qualified Mathematics teachers, providing Mathematics laboratory, introducing Mathematics practical classes, establishing Mathematics club and building confidence on students.

The finding revealed that the mean achievement scores of student taught with constructivist approach was higher than those taught with lecture method. This indicated that student in experimental group (constructivist approach) had improved their scores after participation in constructivist approach of teaching. Analysis in Table 8 further showed that significant differences exist between students taught Mathematics using constructivist approach and those taught with lecture method. The finding agreed with the findings of Ogunkunle (2007) and Ogbonna (2013), who found constructivist approach was very effective in teaching concepts and enhancing students' achievement. The findings further revealed in Table 6 that male students who were taught using constructivist approach performed as well as female students taught with the same approach. When analysis of covariance was applied, it revealed that there was no significant difference between male and female students achievement in Mathematics. The findings was also in line with Okoroafor (2007) and Ogbonna (2013) who found that there was no significant difference between male and female students taught Mathematics with constructivist approach.

The finding equally revealed that urban students taught Mathematics using constructivist approach performed as well as rural students taught with the same approach. Analysis of data in Table 10 showed that there is no significant difference between the mean achievement scores of urban and rural students taught Mathematics using constructivist approach. The finding confirmed the findings of Okoroafor (2007), who observed that there was no significant difference between the mean achievement scores of urban and rural students taught using constructivist approach. Hence, location is not a significant factor in students achievement when using constructivist approach.

V. Conclusion

The finding of this study revealed that there exists Mathemaphobia among secondary school students in Abia State. Causes of Mathemaphobia among students were highlighted which include poor foundation in Mathematics, improper teaching of Mathematics content, low self esteem, difficult contents/content, lack of teaching and learning materials, high expectation on Mathematics and unqualified Mathematics teachers. The effects of Mathemaphobia were identified such as poor performance in Mathematics, hinders admission into high institution poor logical and critical thinking, inadequate day-to-day mathematical transaction and lack of confidence and trust. Some of the strategic measures to reduce Mathemaphobia were revealed such as establishment of Mathematics club in schools, building of Mathematics confidence, provision of adequate and

regular reinforcement and provision of adequate instructional materials. The finding equally demonstrated the effectiveness of constructivist approach in teaching and learning of Mathematics. Thus, it had shown that innovative and activity-oriented approaches can be used to reduce Mathemaphobia among students. In addition, it was finding that gender and location were not significant factors in students achievement in Mathematics.

VI. Recommendations

Based on the findings, the following recommendations are made;

1. Mathematics teachers should encourage students to develop confidence and participate actively in Mathematics teaching and learning.
2. Mathematics club should be established in school to encourage active participation of students.
3. Adequate instructional materials should be provided by the government both in quality and quantity and evenly distributed to schools.
4. Government should ensure that only qualified Mathematics teachers are employed to handle the subject.
5. Standard Mathematics laboratories should be established in all the secondary schools.
6. Mathematics teachers should be encouraged to attend workshops, seminars and conferences in order to upgrade and update their knowledge on Mathematics innovative areas.
7. Mathematics teachers should be encouraged to be gender responsive in teaching and teaching of Mathematics.
8. Students should be encouraged and helped to overcome their Mathematics phobia by developing confidence in them.
9. Practical Mathematics classes should be introduced in Nigerian schools.

Table 1: Trends on Students Performance in WASSCE (2012-2016)

Y e a r	T o t a l	S a t	T o t a l	P a s s e d	w i t h	A 1 - C 6	%
2 0 1 2	1 , 6 7 5	2 2 4 8	1 9	3	9	0 4 9	. 0 0
2 0 1 3	1 , 5 4 3	6 8 3 5	5 5	7	2	6 3 6	. 0 0
2 0 1 4	1 , 6 9 2	4 3 5 5	2 9	7	3	2 3 1	. 3 0
2 0 1 5	1 , 5 9 3	4 4 2 5	4 4	5	3	8 3 4	. 1 8
2 0 1 6	1 , 5 4 4	2 3 4 5	9 7	3	1	0 3 8	. 6 8
M e a n							% 3 7 . 8 3

Source: Test Development Unit: West African Examination Council, Lagos 2017

Table 2: Mean and Standard Deviation of Mathemaphobia Existence (N=833)

S / N	Mathemaphobia Existence	VHE	HE	LE	VLE	Total	Mean \bar{X}	S D	Decision
1	I am afraid of Mathematics as a subject	4 3 0	2 0 0	1 2 0	8 3	2 6 4 3	3 . 1 7	1 . 2 8	H E
2	I derive joy in learning Mathematics	4 3	2 1 0	3 0 0	2 8 0	1 6 8 2	2 . 0 2	0 . 8 9	L E
3	I struggle to learn Mathematics	3 3 3	2 9 0	2 0 0	1 0	2 6 1 2	3 . 1 4	0 . 8 2	V H E
4	Mathematics is my best subject	1 1 5	8 2	2 3 6	4 0 0	1 5 7 8	1 . 8 9	1 . 0 6	L E
5	I am scandy of numbers and calculation	4 1 0	2 5 1	1 0 0	7 2	2 6 6 5	3 . 2 0	0 . 9 6	V H E
6	I panic at the mention of Mathematics test and homework	3 7 3	2 5 6	1 1 5	8 9	2 6 7 9	3 . 2 2	0 . 5 0	H E
7	I dislike Mathematics because of the teacher	2 9 0	3 1 8	1 2 5	1 0 0	2 4 6 4	2 . 9 5	0 . 9 9	H E
8	Mathematics textbook is too difficult to understand	4 0 5	2 2 5	1 0 3	1 0 0	2 6 0 1	3 . 1 2	1 . 0 4	H E
9	I have adequate Mathematics learning materials	1 7 0	1 8 9	2 1 5	3 5 9	1 7 3 6	2 . 0 8	1 . 1 6	L E
G r a n d M e a n							2 . 7 5		

Table 3: Mean and Standard Deviation on the Causes of Mathemaphobia (N=833)

S / N	Mathemaphobia Existence	S	A	A	D	S D	Total	Mean \bar{X}	S D	Decision
1 0	Poor foundation in Mathematics	3 5 0	3 0 0	1 4 0	4 3	2 6 2 3	3 . 1 5	0 . 8 8	A g r e e d	
1 1	Improper teaching of Mathematics content	3 8 9	2 7 5	1 0 0	6 9	2 6 4 0	3 . 1 7	0 . 9 8	A g r e e d	
1 2	L o w s e l f e s t e e m	2 8 0	2 6 0	1 5 0	1 4 3	2 3 4 3	2 . 8 1	1 . 0 9	A g r e e d	
1 3	Difficult content/ concepts	3 3 0	2 5 0	1 9 0	6 3	2 5 1 3	3 . 0 2	0 . 9 5	A g r e e d	
1 4	Lack of teaching and learning materials/infrastructure	4 1 0	2 9 0	8 5	4 8	2 7 2 8	3 . 2 8	0 . 8 7	A g r e e d	
1 5	High expectation on Mathematics	3 0 0	2 1 0	2 7 0	5 3	2 4 2 3	2 . 9 1	0 . 9 6	A g r e e d	
1 6	Lack of adequate in-service training	2 5 0	2 6 5	2 0 0	1 1 8	2 3 1 3	2 . 7 8	1 . 0 3	A g r e e d	
1 7	Lack of proper incentives	2 7 0	3 0 6	1 5 0	1 0 7	2 4 0 5	2 . 8 9	1 . 0 0	A g r e e d	
1 8	Shortage of qualified Mathematics Teachers	3 0 0	2 8 5	1 6 5	8 3	2 4 6 8	2 . 9 6	0 . 9 9	a g r e e d	
1 9	Inherent fear of Mathematics	2 8 0	2 9 0	2 0 0	6 3	2 4 5 3	2 . 9 4	0 . 9 4	A g r e e d	
G r a n d M e a n							2 . 9 9			

Table 4: Mean and Standard Deviation on Effects of Mathemaphobia (N=833)

S / N	Mathemaphobia Existence	S	A	A	D	S	D	Total	Mean \bar{X}	S	D	Decision
2 0 .	Poor performance in Mathematics and other related subjects	3 7 0	280	1 4 3	4 0	2 6 4 6	3 . 1 8	0 . 8 8	Agreed			
2 1 .	Hinders admission into higher institutions	4 0 0	200	1 8 0	5 3	2 6 1 3	3 . 1 2	0 . 9 7	Agreed			
2 2 .	Leads to poor logical and critical thinking among students	2 8 0	270	1 5 0	1 3 3	2 3 6 3	2 . 8 4	1 . 0 6	Agreed			
2 3 .	Inadequate day to day Mathematical transaction	2 9 0	250	1 6 0	1 3 3	2 3 6 3	2 . 8 4	1 . 0 7	Agreed			
2 4 .	Lack of interest in Mathematics	3 9 5	286	1 5 0	2	2 7 4 0	3 . 2 9	0 . 7 6	Agreed			
2 5 .	Negative attitudes towards Mathematics	3 1 5	209	1 4 0	1 6 9	2 3 3 6	2 . 8 0	1 . 1 5	Agreed			
2 6 .	Lack of confidence on Students	2 9 0	309	1 8 5	5 0	2 5 0 4	3 . 0 1	0 . 9 0	Agreed			
G r a n d M e a n									3 . 0 1			

Table 5: Mean and Standard Deviation on the Strategic Measures to Reduce Mathemaphobia (N=833)

S / N	Mathemaphobia Existence	S	A	A	D	S	D	Total	Mean \bar{X}	S	D	Decision
2 7 .	Building of Mathematics confidence on students	4 0 5	225	1 0 3	1 0 0	2 6 0 1	3 . 1 2	1 . 0 4	Agreed			
2 8 .	Providing of motivational and regular positive reinforcement to students	3 0 0	285	1 6 5	8 3	2 4 6 8	2 . 9 6	0 . 9 9	Agreed			
2 9 .	Establishing of standard Mathematics laboratories in schools'	2 8 0	270	1 5 0	1 3 3	2 3 6 3	2 . 8 4	1 . 0 6	Agreed			
3 0 .	Making Mathematics teaching and learning activity-oriented and learner-centered	4 1 0	251	1 0 0	7 2	2 6 6 5	3 . 2 0	0 . 9 6	Agreed			
3 1 .	Establishing of Mathematics club in schools	4 1 0	200	1 0 0	1 2 3	2 5 6 3	3 . 0 9	1 . 1 0	Agreed			
3 2 .	Teaching Mathematics with mnemonics, quiz competitions and funs	2 3 0	275	1 7 8	1 5 0	2 2 5 1	2 . 7 0	1 . 0 6	Agreed			
3 3 .	Providing of adequate instructional materials, facilities and infrastructure	3 8 0	220	1 0 5	1 2 7	2 5 1 7	3 . 0 2	1 . 0 9	Agreed			
3 4 .	Introducing practical classes in Mathematics	2 0 0	328	2 1 0	1 0 5	2 3 0 9	2 . 7 7	0 . 9 2	Agreed			
G r a n d M e a n									2 . 9 6			

Table 6: Mean and Standard Deviation of the Achievement of Students Taught with Constructivist Approach and Lecture Method

Teaching Approach	N	Pre - Test Mean \bar{X}	Post Test Mean \bar{X}	Mean Gain
Experimental (Constructivist Approach)	9 0	2 5 . 9 3	4 5 . 8 7	1 9 . 9 4
Control Group (Lecture Method)	8 4	2 3 . 9 0	4 2 . 8 0	1 8 . 9 0
Mean Difference				1 3 . 8 4

Table 7: Mean and Standard Deviation of Male and Female Students Taught Mathematics using Constructivist Approach

Teaching Approach	Sex	N	Pre - Test Mean \bar{X}	Post Test Mean \bar{X}	Mean Gain
Experimental (Constructivist Approach)	Male	4 5	2 8 . 8 9	5 7 . 8 2	2 8 . 9 3
	Female	4 5	2 9 . 6 4	7 1 . 1 1	2 9 . 8 7
Mean Difference					0 . 9 4

Table 8: Mean and Standard Deviation of Urban and Rural Students Taught Mathematics Using Constructivist Approach

Teaching Approach	Sex	N	Pre - Test Mean \bar{X}	Post Test Mean \bar{X}	Mean Gain
Experimental (Constructivist Approach)	Urban	5 0	2 9 . 9 4	5 9 . 5 2	2 9 . 5 8
	Rural	4 0	2 8 . 4 3	7 4 . 5 5	2 9 . 1 7
Mean Difference					0 . 4 1

Table 9: Analysis of Covariance (ANCOVA) of Students Taught Mathematics Using Constructivist Approach and Lecture Method

Source of variation	Sum of Square for x (SSx)	Sum of Square for y (SSy)	Total sum of Products (TSP)	D f	Adjusted SS ¹ y	M S ¹ y	F - cal	F - crit
Between Group	1 2 4 9 . 1 4	1 0 9 5 7 . 8 6	3 6 9 9 . 7 1	1	7 1 3 0 . 7	7 1 3 0 . 7		
Within group	1 0 7 0 6 . 8 4	2 4 1 8 0 . 1 4	4 6 7 9 . 2 9	1 7 2	2 2 1 3 5 . 1 2	1 2 8 . 6	55.41	3.89
T o t a l	11,955.98	35,138.00	8 3 7 9 . 0 0	1 7 3				

Table 10: Analysis of Covariance (ANCOVA) of Male and Female Students Taught Mathematics Using Constructivist Approach

Source of variation	Sum of Square for x (SSx)	Sum of Square for y (SSy)	Total sum of Products (TSP)	D f	Adjusted SS ¹ y	M S ¹ y	F - cal	F - crit
Between Group	1 2 . 8 4	6 4 . 1 8	2 8 . 7 1	1	3 4 . 1 7	3 4 . 1 7		
Within group	3 1 9 0 . 7 6	1 5 , 1 8 3 . 8 2	2 0 9 9 . 2 9	8 8	1 3 9 4 . 3 4	1 5 9 . 0 0	0.21	3.96
T o t a l	3 5 . 0 3 . 6	1 5 2 4 8	2 1 2 8 8 9					

Table 11: Analysis of Covariance (ANCOVA) of Urban and Rural Students Taught Mathematics Using Constructivist Approach

Source of variation	Sum of Square for x (SSx)	Sum of Square for y (SSy)	Total sum of Products (TSP)	D	f	Adjusted SS ¹ y	M S ¹ y	F - c a l	F - c r i t
Between Group	5 1 . 0 1	8 1 . 3 2	6 4 . 6 4	1		2 2 . 5 5	2 2 . 5 5		
Within group	3452.59	15166.08	2063.36	8	8	13932.96	158.33	0.14	3.96
T o t a l	3503.6	15248	2128.00	8	9				

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