MATHEMATICS PHOBIA AND EFFECTIVE LEARNING AMONG SENIOR SECONDARY SCHOOL STUDENTS' IN CALABAR SOUTH LOCAL GOVERNMENT AREA OF CROSS RIVER STATE

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Abstract
This study investigated the effect of mathematics phobia on effective learning of mathematics among senior secondary school students in Calabar South Local Government Area of Cross River state. Two research questions and two hypotheses guided the study. Survey research design was used for the study. A sample of 168 respondents (75 males and 93 females) out of a total of 2576 SS2 students were used. A self-developed questionnaire tagged "Mathematics Phobia Questionnaire" was used in the study. The internal consistency of the instrument was found to be 0.82 using Cronbach Alpha. Data collected were analyzed using t-test statistic and decisions were taken at 0.05 level of significance. The result of the analysis revealed that mathematics phobia has significant effect on effective learning of mathematics. Also, female students do not significantly differ from their male counterparts in the exhibition of mathematics phobia. On the basis of these findings, it was recommended among others that teachers should motivate and encourage learners to develop positive attitude towards mathematics learning.

Keywords: mathematics, phobia, mathematics phobia, effective mathematics learning

Introduction

From cradle, children learn basic concepts in mathematics such as counting of numbers, addition, subtraction, multiplication among others. While some children develop likeness for the subject as it progresses from simple to complex, others develop hatred based on their inability to understand what is being taught or other besetting factors. This hatred tends to progress even to the learners' higher level of education. There is a generally wrong perception by most students that mathematics is a difficult discipline to study and some students even run away from careers that has mathematics as a mandatory course to offer.

Mathematics is the science that deals with the logic of shape, quantity and arrangement. Ucheche (2013) viewed mathematics as a science of number, space, language, science and technology. The researcher further reiterated that mathematics is a branch of

science that is essential in every field of academic endeavor that man uses to solve challenges of life. Ebe (2000) also described mathematics as an important weapon that enhances academic and career choice of individuals of different sex and age. Despite all these enormous roles of mathematics in people's lives, learners still have negative attitude towards the subject and shy away from studying it as much as possible. This negative attitude towards the subject is what leads to the learners' fear for it which is referred to as mathematics phobia.

Boruah & Saika (2014) viewed mathematics phobia as the fear that hinders mathematics performance. In the same vein, Ashcraft (2002) considered mathematics phobia as a feeling of tension, apprehension or fear that interferes with mathematics performance. This include panic, helplessness and mental disorganization which has negative impact on health issues and the desire to learn. Tulfors (2003) explained the concept of mathematics phobia to be an emotional response that are learnt, causing frequent, severe and unexplainable fear of a situation, learning experience, object or place. Relatedly, Sloan, (2002) described mathematics phobia as a construct that is related to lack of confidence, poor achievement levels, poor learning behavior, mathematics avoidance, negative attitude towards mathematics, low self-efficacy and feeling of inadequacy. Olaniyan & Salman, (2015) also defined mathematics phobia to be mathematics weakness in students that affect their psychological and mental dimensions of learning. The researchers further reiterated that mathematics phobia in students is characterized by feverish feelings in mathematics classes, truancy, refusal to do mathematics assignment and lack of interest in mathematics classes. Khalid (2010) viewed mathematics phobia as the fear or anxiety disorder which causes withdrawal, panic and uncertainty. Wilson (2012) discovered from his studies that mathematics phobia is characterized by uneasiness, avoidance, feeling of physical illness and panic during mathematics classes.

Research studies carried out by various research scholars have indicated the presence of mathematics phobia among secondary school students. Zettle & Raines (2000) in their research studies found out that majority of the students who enrolled in college algebra and other preparatory courses rated themselves to be math anxious. Chang & Bullock (2016) revealed from their research studies that mathematics phobia is a global and highly prevalent phenomenon. In support of this view, Chinn (2009) stated that the prevalence of extreme math phobia is estimated to be between 2- 6% at secondary school level in the United Kingdom and that 68% of the students who enroll in mathematics classes experience high math anxiety.

Bamidele (2005) found out from his study that in Nigeria generally, students have negative impression about mathematics as a dreadful subject and hence perform poorly in math examinations. Ashcraft (2002) revealed that students who are anxious about mathematics will avoid lessons or situations that will present them with mathematical computations. Such avoidance makes students incompetent in solving mathematical computations. Furner & Duffy (2002) pointed out that poor test grades, inability to complete difficult assignments, negative predisposition of parents and even the math teacher may influence students into having phobia for mathematics. Awofala (2000) in his study, revealed that most secondary school students put up negative attitude towards mathematics and shy away from subjects that are mathematics related. This negative attitude of students was attributed to factors like lack of mathematics laboratory, incompetence on the part of mathematics teachers and absence of ICT facilities.

Considering the difference between male and female in exhibition of math phobia, Arigbabu, Balogun, Oladipo, Ojedokun, Opeyemi, Enikanoselu, Owoyele, Owolaba, Gabriel & Oluwafemi (2012) carried out a study to ascertain the correlates of mathematics anxiety among single sex educational schools in Nigeria with a study sample of 450 participants and discovered that age correlated significantly positively with mathematics anxiety but gender had a negative correlation

with mathematics anxiety. Mutodi & Ngirande (2014) also from their study on exploring mathematics anxiety using a sample of 120 students (84 males and 36 females) found out that there is a high level of mathematics anxiety among female students, showing a significant mean difference between mathematics anxiety and gender. Josiah & Adejoke (2014) carried out a study on the effect of gender, age and mathematics anxiety on college students' achievement in algebra using all undergraduate computer/ mathematics as sample for the study. The result revealed average performance in algebra course and the difference in achievement with regards to gender and age were grouped as low, medium and high with all non-significant effect of mathematics phobia. Tulfors (2003) carried out a study on the relationship between mathematics anxiety and gender using 134 university students as sample. Result from the study indicated that gender had no significant effect on attitude toward mathematics, gender and mathematics anxiety had no influence on attitude towards mathematics. Similarly, Devine, Fawcett, Szucs & Dowker (2012) carried out a study to measure the mathematics performance of boys and girls and their mathematics anxiety levels. Findings from the student did not reveal any significant difference in mathematics performance but indicated a positive and negative correlation between mathematics anxiety for girls and boys. 433 British secondary school students in school year 7, 8 and 10 represented the sample for the study. Mathematics phobia is indeed a cankerworm that affects learners adversely but can be ameliorated if effective teaching and learning is predominant.

Mathematics learning is said to be effective if the set goals or objectives of the mathematics lesson is achieved by the learners. Effective mathematics learning can only take place when an effective teaching strategy is used. Obrakpo (2009) inferred that for a teaching strategy to be effective, there is need for pre-planning of lessons where the teacher discovers the prior knowledge of the learner, considers the learners' age, the scope of learning task and materials available for meaningful instruction. The teacher then organizes a suitable learning environment and facilitates the teaching process through appropriate techniques to realize the teaching objectives.

Louise (2005) also asserted that for mathematics learning to be effective, progress in mathematics should be built upon previously learnt skills, coupled with mathematics instructions being clear, unambiguous and systematic with key prerequisite skills taught in advance. The researcher further added that it is very essential for learners to have sufficient practice to acquire new skills. For example, learning computational algorithms such as those in long division and multiplication of two or more digits often requires much practice. Students with mathematics disabilities also have to be taken into considerations for effective learning to be achieved. These math disabilities include difficulties in automatic recall of mathematical facts, difficulty with computational algorithms and visual-spatial difficulties. Appropriate pedagogy should used to take care of learners of these category. Also, a thorough evaluation that assesses wide range of important mathematics skills is necessary for effective learning to occur. With the evaluation, the teacher realizes the strengths and weaknesses of learners for appropriate remediation/ effective instructional planning. In addition, it is believed that student-centered teaching is more appropriate for effective learning to be achieved. This approach this approach has student responsibility and activity at its heart. This responsibility and independence help to develop characteristics of life long learner's motivation, self-evaluation, time management and the skills to assess information.

Students with mathematics phobia tend to have negative attitude towards the subject and hence, affect these learners in other fields of study that requires calculation. Continual low performance of learners in mathematics can result into math phobia, whereby the students feel that the subject is too difficult to be understood and thus, become scared. It is to this effect that the researcher investigated the extent to which mathematics phobia affects

effective learning of the subject. Also, while research findings of some authors revealed that mathematics phobia among learners are gender related, findings of some other authors negates this. Hence the researcher sought to determine if mathematics phobia is gender related or not.

Statement of the problem

Improving the academic achievement of learners in mathematics has been a matter of national concern for decades. The state of mind of the learner is one of the determinant factors in mathematics learning and achievement. Mathematics phobia and its negative effect on the overall performance of students in mathematics has tremendously affected students in their career and even career choices. This issue has been of much concern to education stakeholders in Nigeria including the government, parents, school administrators, teachers and the students alike. Research scholars have carried out so much investigations to ascertain the causes of math phobia and also proffered solutions but this problem still persist enormously among learners.

It is in this regard that the study investigated mathematics phobia and effective mathematics learning among senior secondary school students in Calabar South Local Government Area of Cross River State to determine the extent to which mathematics phobia adversely affects the effective learning of mathematics and to determine if this cankerworm is gender related or not.

Purpose of the study

The purpose of this study is to:

1. Investigate the extent to which mathematics phobia affects effective learning of mathematics among senior secondary school students in Calabar South Local Government Area of Cross River State.
2. Determine if mathematics phobia differ across gender among senior secondary school students in Calabar South Local Government Area of Cross River State.

Research question

To guide the research, the following questions were raised:

1. To what extent does mathematics phobia affect effective learning of mathematics among senior secondary school students in Calabar South Local Government Area of Cross River State.
2. How do senior secondary male students differ from their female counterpart in the exhibition of mathematics phobia in Calabar South Local Government Area of Cross River State?

Research Hypotheses

The following research hypotheses were formulated for the purpose of the study:

1. Mathematics phobia does not significantly affect effective learning of mathematics.
2. Senior secondary male students do not significantly differ from their female counterpart in the exhibition of math phobia.

Significance of the study

This study will be significant to mathematics teachers and learners if the recommendations are utilized. Resource centers and Ministry of Education will benefit from the study for instructional resource decision making for schools as instructional strategies that encourage learners to develop positive attitude towards mathematics will be adopted. The study will generate research information that will motivate researchers to investigate on mathematics phobia.

Methodology

The study adopted survey research design. This design was considered appropriate because the design investigated situation as it exist presently in the study area. The population of this study consist of all senior secondary school two mathematics students in Calabar South Local Government Area of Cross River state. Stratified random sampling technique was

adopted for this study and a total of one hundred and sixty-eight (168) students were sampled out of a total population of 2576 students. This comprised of 75 males and 93 females. The instrument used for the study was Mathematics Phobia Questionnaire (MPQ) which was constructed by the researchers using a four-point Likert scale consisting of the options; Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD) and were assigned the values 4, 3, 2, 1 respectively. The instrument was validated by two experts from the Department of Educational Foundations, University of Calabar and was pilot tested on 50 students who were not part of the study. The internal consistency of the instrument was determined using Cronbach Alpha and was found to be 0.82.

The questionnaires were administered on the respondents by the researchers and other two research assistants with a return rate of 100 percent. Mean and standard deviations were used to answer the research questions while independent t- test statistic was used to test the hypotheses at 0.05 level of significance.

Result

Research question one

To what extent does mathematics phobia affect effective learning of mathematics among senior secondary school students in Calabar South Local Government Area of Cross River State.

Table 1: Mean responses on the extent to which mathematics phobia affects effective learning of mathematics among senior secondary school students in Calabar South Local Government Area of Cross River state.

S/N	ITEMS	N	MEAN	SD	DECISION
1	I pretend to be sick during math lessons	168	3.20	1.79	Accepted
2	I simply hate math because it is difficult	168	3.00	1.73	Accepted
3	I fear being called out to answer or solve any mathematics question.	168	2.89	1.64	Accepted
4	I often feel tired and bored in math classes.	168	3.90	1.70	Accepted
5	I run away and dislike subjects with calculation.	168	3.10	1.76	Accepted
6	I go to school late in order to miss out from mathematics classes.	168	3.01	1.73	Accepted
7	I feel troubled and worried doing mathematics assignment.	168	3.80	1.95	Accepted
8	I feel tensed up and worried when preparing for math test or exam.	168	3.35	1.82	Accepted
9	I am scared of my mathematics teacher	168	2.85	1.63	Accepted
10	My mind goes blank when my teacher asks math questions.	168	3.10	1.97	Accepted
11	I feel sad and worried whenever it is mathematics period.	168	3.16	1.72	Accepted
12	I hate math because I often perform poorly in the subject.	168	3.18	1.92	Accepted
13	I would have preferred to be a science student if not for math that I fear so much.	168	4.32	2.08	Accepted
14	I feel sleepy in mathematics classes.	168	3.60	1.90	Accepted
15	My heart beats very fast during mathematics lessons.	168	3.35	1.82	Accepted
16	I feel nervous when asked math questions.	168	3.60	1.90	Accepted
17	I am scared at the mention of the subject "mathematics".	168	4.20	2.05	Accepted

Accept if mean score ≥ 2.5

The result in table 1 shows that the mean scores of all items falls above the benchmark of 2.50 and so, all items were accepted. Hence, the result shows that mathematics phobia to a large extent, significantly affects effective learning of mathematics among senior secondary school students.

Research question 2: How do senior secondary male students differ from their female counterpart in the exhibition of mathematics phobia in Calabar South Local Government Area of Cross River State?

Table 2: Mean response of male and female senior secondary school 2 students in the exhibition of mathematics phobia.

Gender	**N**	**Mean**	**SD**
Male	75	3.45	0.43
Female	93	3.48	0.44
Total	**168**	**2.32**	**0.21**

Table 2 above reveals the mean responses of male and female students on the extent of their exhibition of mathematics phobia. The above result shows that male students do not significantly differ from their female counterpart in the exhibition of mathematics phobia as their mean scores are 3.45 and 3.48 respectively. The standard deviations of 0.43 for males and 0.44 for females are also not significantly different.

Hypothesis one

Mathematics phobia does not significantly affect effective learning of mathematics.

Table 3: Independent t-test Analysis on the effect of mathematics phobia on the effective learning of mathematics

GENDER	**N**	**MEAN**	**SD**	**Df**	**t_{cal}**	**t_{crit}**	**Decision**
MALE	75	3.45	0.43	166	1.72	0.08	Reject H_o
FEMALE	93	3.48	0.44				

*Significant at .05 level.

The result of data analysis in table 3 above indicates that, the calculated t-value of 1.72 is greater than the critical t-value of 0.08 at 0.05 level of significance with 166 degrees of freedom. Following this result, the null hypothesis was rejected. This means that mathematics phobia significantly affects effective learning of mathematics.

Hypothesis two

Senior secondary male students do not significantly differ from their female counterpart in the exhibition of math phobia.

Table 4: Independent Sample t-test Analysis on the Mean Responses of Male and Female Students in their exhibition of Mathematics Phobia.

GENDER	**N**	**MEAN**	**SD**	**Df**	**t_{cal}**	**t_{crit}**	**Decision**
MALE	75	3.45	0.43	166	0.48	1.96	Accept H_o
FEMALE	93	3.48	0.44				

*Significant at .05 level.

The table 4 result of data analysis reveals that the critical t-value of 1.96 is greater than the calculated t-value of 0.48 at 0.05 level of significance with 166 degrees of freedom. Arising from this, the null hypothesis is thus retained, hence senior secondary male students do not significantly differ from their female counterpart in the exhibition of mathematics phobia.

Discussion of findings

Hypothesis one was tested as shown in table 3 and result from the analysis reveals that Mathematics phobia significantly affects effective learning of mathematics. This finding synchronizes with the findings of Bamidele (2005), who in a study on mathematics not dreadful found out that in Nigeria generally, students have negative impression about mathematics as a dreadful subject and

consequently perform poorly in examination despite the fact that mathematics is the basis for scientific and technological development of a nation. The finding also agrees with the findings of Olaniyan & Salman (2015) who discovered that mathematics phobia causes weakness in students and affect their psychological and mental state of learning. In the same vein, Boruah & Saika (2014) found out from their studies that mathematics phobia hinders mathematics performance. Sloan (2002) viewed mathematics phobia as a construct that is related to lack of confidence, poor achievement levels, poor learning behavior, mathematics avoidance, negative attitude toward mathematics, low self- efficacy and feeling of inadequacy. The result also draws support from the work of Ashcraft (2002) who described mathematics anxiety and phobia as a feeling of tension and fear that prevent students from achieving success in mathematics. It is revealed from this study that mathematics phobia adversely affects the effective learning of mathematics which in turn leads to poor performance in the subject.

The result of the second hypothesis indicates that there is no significant difference between male and female senior secondary school students in their exhibition of mathematics phobia. This implies that male students exhibit the same level of phobia for mathematics with their female counterparts. The result of the finding confirms the findings of Tulfors (2003) who from their findings discovered that gender had no effect on attitude towards mathematics. The findings of Aribgabu, et al (2012) is also in consonace with the findings of this study as their findings revealed that gender had significant negative correlation with mathematics anxiety. This implies that given the same opportunity and challenges and proper orientation, both males and females will perform equally well in mathematics. However, the findings of Devine, Faecett, Szucs & Dowker (2012) revealed that the levels of mathematics anxiety were higher for girls than boys. Srivastava, Imam & Singh (2016) were of the view that mathematics phobia in secondary school is a function of many interrelated variables like peer group, students' abilities, perception, attitude, socio-economic values, parental occupation and education, family size, size of school, types of management, resources, salaries of teacher, teacher's pedagogical skills, to mention but a few. The researchers further reiterated that generally, higher levels of mathematics phobia are associated with low mathematics performance. Notwithstanding, it may not be the only variable related to mathematics performance but it is a strong indicator.

Conclusion

From the findings of this study, it was revealed that mathematics phobia adversely affects effective learning of mathematics. The study also revealed that senior secondary male students do not significantly differ from their female counterparts in the exhibition of mathematics phobia.

The paper therefore encourages all educational stake holders to put every mercenary into place in order to tackle the problem of mathematics phobia among learners, not only at the senior secondary school level, but at all levels of education in the nation.

Recommendations

1. Mathematics textbooks, ICT resources and math laboratory should be made available to facilitate the effective learning of mathematics. Language of textbooks should be clear and easy to comprehend by students.
2. Teachers should make use of mathematics games, puzzles and other positive experiences in math classes to make the teaching and learning of mathematics fun.
3. Frequent seminars and workshops should be organized for teachers to enable them improve on their pedagogical skills.
4. Parents who are math phobic should avoid making statements around their children that may give them the impression that mathematics is a difficult subject.

5. Peer learning should be encouraged, particularly those who suffer from math phobia.
6. Students should develop positive attitude such as visualization, relaxation technique and frustration breaks to deal with phobia for math.
7. Mathematics teaching should be combined with cognitive behavior therapy in which necessary math concepts and skills are taught and the cognitive distortion about math is corrected.

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