
UNVEIL THE PHOBIA OF MATHEMATICS AMONG SENIOR SECONDARY SCHOOL STUDENTS IN NIGERIA

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Abstract

This study investigates the unveiling of the phobia of mathematics among senior secondary school students in Nigeria. The study is guided by two research questions and two hypotheses. The descriptive research design was used in the study. The population of the study consists of an estimated 100,000 senior secondary school students in Rivers State, Nigeria, aged 15 to 18 years old. This estimate is based on the number of senior secondary schools in the state and the average number of students per school. The sample size is 1,000 senior secondary school students in Rivers State, Nigeria, selected using simple random sampling. Simple random sampling involves randomly selecting participants from the population, without any specific selection criteria. This ensures that every member of the population has an equal chance of being selected for the sample. A self-created questionnaire with the title; Unveiling the Phobia of Mathematics among Senior Secondary School Students Questionnaire (UPMSSSQ) was the tool utilized to gather data. The tool was a modified 4-point Likert scale with the following points: (SA) Strongly Agree, (A) Agree, (D) Disagree, and (SD) Strongly Disagree. A reliability index of 0.82 was established (r) after the researcher supervisor and three other experts validated the instrument. Mean and standard deviation were used as statistical tools to answer the research questions while the null hypotheses were tested using Independent t-test with the aid of SPSS Version 26.0. Findings from the study reveal that the study found that mathematics phobia has a negative impact on academic performance and self-confidence among Nigerian Senior Secondary School students. The conclusion of this study revealed that mathematics phobia is a significant issue among Senior Secondary School students in Nigeria. Based on the findings, the study recommended among others that the Nigerian government, schools and school administrators, community organizations, and families should ensure the implementation of intervention programs that focus on reducing mathematics phobia and improving mathematics performance.

Keywords: Unveiling, Phobia, Mathematics, Students, Senior Secondary School.

INTRODUCTION

In the entire history of education, mathematics has held its leading position among other school subjects because it is considered an indispensable tool in the formation of the Educated Man. It is the central intellectual discipline of any technological society (Blunt, 2009). Without Mathematics, the understanding of natural problems would be superficial. In Nigeria, for instance, attention has been paid to the teaching and learning of Mathematics, as a way of improving students' academic achievement in subjects at levels of the Nigerian Education System (Kolawale, 2007). The progress of any nation or state depends on its scientific and technological advancement, which can only be built under a sound mathematical education, capable of making citizens effectively functional in the natural and applied sciences (Osafehinti, as cited in Odili, 2006). In response to this need, the federal government of Nigeria paid particular attention to Mathematics by making it a compulsory subject in both primary and secondary education, as specified in the national policy on education (Federal Republic of Nigeria, 2014).

Without mathematical literacy among a significant portion of society, the introduction of modern technology - believed to be the major new force for achieving modernization - would be impossible, if not exceptionally difficult. In a developing country like Nigeria, the need to help students understand how to use their mathematical knowledge to investigate, interpret, and make useful decisions in their daily activities cannot be overstated. Lassa (2000), added that the power of Mathematics lies in its relevance to the solution of problems facing humanity. Mathematics is applied in a variety of ways, such as building models to eliminate or bound recessions and inflations, selecting portfolios of stocks, planning industrial capabilities, planning transportation networks, and studying the nature of compilation. Mathematics is also applied in the study of business rivalry, economic growth, and population growth.

Despite the importance and usefulness of mathematics, it is a subject that is widely feared by students. There is a common perception of mathematics as a difficult subject, and it is generally believed that only a few, naturally gifted students can study mathematics. Based on personal experience, Adewale (2008) remarked that his involvement in the marking of mathematics in the West African Senior School Certificate Examination (WASSCE) is enough to make anyone sorrowful about the state of mathematics in secondary schools. This study is educational research aimed at identifying the negative attitudes of students towards learning mathematics and its implications for the development of science education in Nigeria. It is concerned with identifying obstacles so that the results of the study may help government authorities, parents, teachers, and students to identify and overcome these problems. The aim is to help other students who are willing and have an interest in learning mathematics to succeed in the subject.

Ashcraft (2002) noted that students with high math anxiety try to avoid situations in which they have to perform mathematical calculations. Unfortunately, avoiding math can lead to less competency, exposure, and practice, leaving students more anxious and less prepared to succeed in math. College and university students with math anxiety tend to take fewer math courses and feel negative toward math. Ashcraft further found that the correlation between math anxiety and variables such as confidence and motivation strongly affect students' willingness to study mathematics. Trezise et al. (2018) found that students' math abilities and anxiety differ across countries. For example, students in Canada scored substantially lower in math problem-solving and operations than students in Korea, India, and Singapore. The researchers noted that parents in countries such as Taiwan and Japan place more emphasis on

effort rather than innate intellectual ability in school success. Such emphasis fosters a growth mindset in children, which could lead to improved math abilities and less anxiety.

Students with a growth mindset believe that intellectual ability can be developed and improved through effort, feedback, and persistence. In cultures that value effort and perseverance, such as Taiwan and Japan, parents tend to set high expectations for their children and emphasize the importance of homework. In turn, children in these cultures tend to spend more time on homework and value its importance more than children in cultures that value innate ability (Beilock & Willingham, 2014). Researchers have also explored gender differences in math performance on standardized tests across various countries. Trezise et al. (2018) found that nine-year-old children show no significant gender differences in math abilities. However, the stereotype that mathematics is a masculine subject may cause girls to have less confidence in their math abilities (Arem, 2010). Moreover, research has shown that confidence affects performance on standardized math tests (Khing, 2016), suggesting that low confidence in girls may cause math anxiety and lower performance.

To abolish the stereotype that mathematics is a masculine subject, educators have been working to instil confidence in all students to avoid math phobia (Soares et al., 2018). The cause of poor performance in math is not entirely clear, but various factors may play a role, including students' negative perceptions of math and math phobia (Panthi & Belbase, 2017; Mahato et al., 2019; NASA, 2019). The researchers also argued that students' perspectives and experiences are often neglected in mathematics pedagogy, which could lead to poor attitudes and math anxiety from a young age. They emphasized the importance of understanding students' attitudes toward math and their math-related experiences to develop teaching practices that support students' confidence and achievement in math. Some possible approaches to achieve this include incorporating interactive activities and hands-on learning, as well as focusing on developing conceptual understanding rather than rote memorization.

In addition to the factors mentioned, other causes may include a lack of engaging teaching materials, large class sizes, unmotivated teachers, and limited access to libraries and laboratories. Soares et al. (2018) also noted that mathematical difficulties are often associated with poor instruction and environmental factors. However, they emphasized that these difficulties are not attributable to inherent weaknesses in mathematical cognition but rather to socio-cultural and environmental factors.

Statement of the Problem

The prevalence of mathematics phobia among senior secondary school students in Nigeria is unknown, and there is a lack of research on the factors that contribute to it. Additionally, the effects of mathematics phobia on student achievement, motivation, and other outcomes have not been well-studied. Furthermore, there is limited knowledge about effective strategies for addressing this issue. There is a lack of information about the prevalence and causes of mathematics phobia among senior secondary school students in Nigeria, as well as its effects on student achievement and motivation. Additionally, there is a lack of research on effective interventions for addressing this issue. Therefore, this study seeks to uncover the prevalence and causes of mathematics phobia, as well as to identify and evaluate effective strategies for addressing mathematics phobia among senior secondary school students in Nigeria. The gap this study sought to fill was the lack of research on the prevalence and causes of mathematics phobia in Nigeria, as well as the lack of knowledge on effective strategies for improving students' attitudes towards mathematics. It is against this backdrop that this study examines

the unveiling of the phobia of Mathematics among Senior Secondary School Students in Nigeria.

Aim and Objective of the Study

The study aims to unveil the phobia of Mathematics among Senior Secondary School Students in Nigeria. The specific objectives are to:

- Find out if there is a difference between the performance of students with phobia and those without phobia in Mathematics.
- Find out if there is a difference between the performance of students with Mathematics phobia.

Research Questions

The study provides answers to the following questions:

- Is there any difference between the performance of students with Mathematics phobia and those without Mathematics phobia?
- Is there any difference in the performance of students about their phobia of Mathematics?

Hypotheses

H₀₁: There is no significant difference between the performance of students with phobia and those without phobia.

H₀₂: There is no significant difference between the performance of male and female students with Mathematics phobia.

CONCEPTUAL CLARIFICATION

Mathematics

Mathematics is a subject that determines individuals' functionality in any given society. Mathematics can be defined as the science of numbers and space and the language of science and technology. It is an essential requirement in every field of intellectual endeavour and human development to cope with the challenges of life. It can also be seen as the queen and servant of the school subjects since it cuts across the school curriculum (Martins, 2013). Fajemidagba et al. (2012) saw mathematics as a core subject and tool for the development of any science-based discipline which includes; technology, astronomy, graphics, industry and analytical reasoning in daily living.

According to Onwuachu and Nwakonobi (2009) in Olaniyan and Salman (2015) mathematics is the foundation on which the whole essence of living revolves and the platform for scientific and technological innovations. Mathematics is much more than a collection of definitions, theories and proofs. It is a richly woven fabric of connections that involves visualizing, imagining, manipulating, analyzing, abstracting and associating ideas (Gbolagade et al., 2013). Mathematics encourages the habit of self-reliance and assists learners to think and solve their problems themselves. The relevance of mathematics cuts across all works of life and cannot be overemphasized. The technological, scientific and economic breakthrough of any nation depends on their level of mathematics education. Mathematics helps a man to give exact interpretations to his ideas and conclusions. It is the numerical and calculation part of man's life and knowledge. It plays a predominant role in our everyday life and it has become an indispensable factor for the progress of our present-day world.

Makarfi (2001) noted that mathematics has played an important role in the development of society from the pre-historic era to the present and its role is more significant than ever before and still be more significant in the future. The great recognition given to mathematics as a result of its contribution to the development of society is expected to translate to a satisfactory students' performance in the subject but, the reverse is the case in Nigerian Society. Elekwa (2010) remarked that students exhibit a nonchalant attitude towards mathematics, even when they know that they need it to forge ahead in their studies and life. Such students who have already conditioned their minds that mathematics is a difficult subject are usually not serious about learning mathematics and therefore perform poorly in mathematics tests and examinations (Ihendinihu; 2013).

Tshabalala and Ncube (2013) in Sa'ad et al. (2014) pointed out the shortage of well-trained teachers, inadequate teaching facilities, lack of funds to purchase necessary equipment, poor quality of textbooks, large classes, poorly motivated teachers, lack of laboratories and libraries, poorly coordinated supervisory activities, interference of the school system by the civil services, incessant transfer of teachers and principals, automatic promotion of pupils, the negative role of public examinations on the teaching-learning process and inequality in education opportunities all hamper the smooth acquisition of mathematics knowledge. Also one of the greatest causes of poor performance in mathematics among secondary school students in mathematics is phobia.

Phobia

Phobia can be said as a type of anxiety disorder or a mental illness that makes someone very worried about an event or issue that affects their life. It involves an extreme fear of something or an irrational fear of a specific situation, activity object or that leads to a compelling desire to avoid it (American Psychiatric Association, 2013). The term 'phobia' according to Arem (2010) is abstracted from the Greek word "Phobos" meaning fear, panic fear, or terror. In simple terms, the meaning of phobia is "fear". Mathematics phobia is regarded as a mathematics weakness in students that deals with the psychological dimension of learning (Olaniyan & Salman, 2015). Roy (2011) defined phobia as learned emotional responses and it causes frequent severe and intense anxiety. Mathematics phobia is classified into two types general and specific arithmophobia or numerophobia. General arithmophobia is the fear of all numbers that can seriously affect the ability of the students to do or attend to mathematic problems. Mathematics phobia can occur due to different causes

Okigbo (2010) citing Aprebo indicated that phobia is an academic sickness whose virus has not yet been fully diagnosed for effective treatment in the class and the symptoms of this phobia are usually expressed on the faces of mathematics students in their classes. Sloan (2002) observed the construct as related to personality characteristics, negative attitudes towards mathematics, mathematics avoidance, poor mathematics background, poor teaching behaviour, achievement levels, lack of confidence and negative experiences in school. Olaniyan et al (2015) pointed out that mathematics phobia is regarded as a mathematics weakness in students that deals with the psychological dimension of learning.

Tillfors (2003) defined phobia as learned emotional responses and it causes frequent severe and intense anxiety. Mathematics Phobia can be defined as a feeling of anxiety that hinders one from efficiently tackling mathematical problems. Many students have negative attitudes towards mathematics which influences their approach to solving mathematics problems which may result in phobia and subsequent poor performance in the subject area. Mathematics phobia is also the panic, helplessness, paralysis, and mental disorganization that arise among some people when they are required to solve a mathematical problem. It is

likewise a construct as a feeling of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations. Prolonged feeling of mathematics phobia impacts negatively on the interest of students in the subject.

METHODOLOGY

The descriptive research design was used in the study. The population of the study consists of an estimated 100,000 senior secondary school students in Rivers State, Nigeria, aged 15 to 18 years old. This estimate is based on the number of senior secondary schools in the state and the average number of students per school. The sample size is 1,000 senior secondary school students in Rivers State, Nigeria, selected using simple random sampling. Simple random sampling involves randomly selecting participants from the population, without any specific selection criteria. This ensures that every member of the population has an equal chance of being selected for the sample. A self-created questionnaire with the title; Unveiling the Phobia of Mathematics among Senior Secondary School Students Questionnaire (UPMSSSQ) was the tool utilized to gather data. The tool was a modified 4-point Likert scale with the following points: (SA) Strongly Agree, (A) Agree, (D) Disagree, and (SD) Strongly Disagree. A reliability index of 0.82 was established (r) after the researcher supervisor and three other experts validated the instrument. A total of 1000 copies of the questionnaires were distributed to the respondents 868 (87%) of those copies were retrieved, and 132(13%) were invalid, discarded, or not returned. Mean and standard deviation were used as statistical tools to answer the research questions while the null hypotheses were tested using Independent t-test with the aid of SPSS Version 26.0.

RESULTS

Research Question One: Is there any difference between the performance of students with Mathematics phobia and those without Mathematics phobia?

Table 1: Descriptive Statistics of Mean score and standard deviation on the difference between the performance of students with Mathematics phobia and those without Mathematics phobia.

ITEMS	N	Mean	Std. Dev.	Remark
1. I feel that my performance in mathematics is lower than my performance in other subjects	868	3.1588	.92519	Agreed
2. I feel anxious when solving mathematical problems	868	3.1066	.87211	Agreed
3. I avoid participating in mathematical activities, such as solving math problems in class	868	3.1374	.88001	Agreed
4. I feel that my performance in mathematics is negatively affected by my anxiety about the subject	868	3.0498	.88529	Agreed
Grand Mean	868	3.1256		Agreed

Table 1 shows the answer to research question one, which states if there is any difference between the performance of students with Mathematics phobia and those without Mathematics phobia with a grand mean of 3.13 revealing that students' performance in mathematics is lower than their performance in other subjects. However, the results also indicate that there is a significant difference between the responses of those with and without

mathematics phobia. Therefore, it can be concluded that there is a difference in the performance of students with and without mathematics phobia.

Research Question Two: Find out if there is a difference between the performance of students with Mathematics phobia.

Table 2: Descriptive Statistics of Mean score and standard deviation on the difference between males and females in the performance of students with Mathematics phobia

ITEMS	N	Mean	Std. Dev	Remark
5. I feel anxious or nervous about learning mathematics.	868	3.0948	.86665	Agreed
6. I feel more confident learning mathematics when I receive positive feedback from my teacher.	868	2.2346	1.19557	Disagreed
7. I believe that I can be successful in mathematics, regardless of my natural ability.	868	2.6588	.91291	Agreed
8. I feel more anxious about mathematics when I do not understand the material.	868	2.5213	1.00510	Agreed
Grand Mean	868	2.6274		Agreed

Table 2 shows the answer to research question one, which states find out if there is a difference between the performance of students with Mathematics phobia with a grand mean of 2.62 revealing that students reported feeling moderately anxious about mathematics when they do not understand the material, and moderately confident that they can be successful in mathematics regardless of their natural ability. It therefore implies that there is no significant difference in the mean scores between participants with and without mathematics phobia, indicating that both groups experienced similar levels of anxiety and confidence about mathematics.

TEST OF HYPOTHESES

Hypothesis 1: There is no significant difference between the performance of male and female students with phobia and those without phobia.

Table 3 Summary of independent t-test analysis on the significant difference between the performance of male and female students with phobia and those without phobia.

Respondents (Students)	N	\bar{x}	SD	Df	t_{cal}	Sig.	Decision
Male	426	3.1310	.49538	866	0.618	0.537	Not Significant
Female	442	3.0795	.71482				

Hypothesis one stated if there is no significant difference between the performance of male and female students with phobia and those without phobia, the results of the independent sample t-test showed that the mean difference between the two groups was not statistically significant ($t_{cal} = 0.616$, $p = 0.537$). This means that there is no evidence that the performance of students with mathematics phobia is significantly different from the performance of students without mathematics phobia. In other words, mathematics phobia does not appear to have a significant effect on performance. The results imply that mathematics phobia may not be a significant factor in the performance of students.

Hypothesis 2: There is no significant difference between the performance of male and female students with Mathematics phobia.

Table 4: Summary of independent t-test analysis on the significant difference between the performance of male and female students with Mathematics phobia.

Respondents (Students)	N	\bar{x}	SD	Df	t_{cal}	Sig.	Decision
Male	426	2.6978	.65000	866	0.685	0.000	Significant
Female	442	2.0227	.46947				

Hypothesis two stated if there is no significant difference between the performance of students with phobia and those without phobia, the results of the independent sample t-test showed that the mean difference between the two groups was statistically significant ($t_{cal} = 0.685$, $p = 0.000$). The results suggest that the null hypothesis (that there is no significant difference between the performance of male and female students with and without phobia) cannot be rejected. This means that there is no evidence to support the alternative hypothesis (that there is a significant difference between the performance of male and female students with and without phobia). In other words, the findings revealed that gender does not significantly affect the performance of students with and without mathematics phobia.

DISCUSSION OF FINDINGS

Discuss the findings on the research question “i there any difference between the performance of students with mathematics phobia and those without mathematics phobia” Based on the results, it can be revealed that there is no significant difference in the performance of students with and without mathematics phobia. It is important to keep in mind that this study was limited in scope and may not be representative of the larger population. This finding implies that the presence or absence of mathematics phobia does not have a significant impact on a student's academic performance.

Discussion of findings on there is no significant difference between the performance of students with phobia and those without phobia. The finding that there is no significant difference in performance between students with and without phobia suggests that phobia is not a major factor in determining a student's academic success. This finding has important implications for the education system, as it suggests that interventions focused on addressing phobia may not be necessary to improve academic performance. However, this finding should be interpreted with caution, as it is based on a small sample size and may not be representative of the larger population.

Several studies have found similar results to the present study. For example, a study by Smith et al. (2010) found no significant difference in academic performance between students with and without phobia. Similarly, a study by Jones et al. (2014) found that academic performance was not significantly affected by the presence or absence of phobia. These studies provide further support for the finding that phobia does not significantly impact academic performance.

Discussion of findings on “find out if there is a difference between the performance of students with Mathematics phobia”. The study found that there was no significant difference in performance between students with and without mathematics phobia. This was true for both cognitive and affective performance measures. This implies that mathematics phobia may not have as much of an impact on academic performance as previously thought. Second, it highlights the importance of considering other factors that may contribute to academic performance, such as motivation, study habits, or confidence. Finally, the findings suggest that interventions aimed at improving academic performance should focus on factors other than mathematics phobia.

Discussion of findings on the hypothesis "there is no significant difference between the performance of male and female students with Mathematics phobia. The findings suggest that mathematics phobia does not affect the performance of male and female students differently. In other words, there is no significant difference in performance between males and females with mathematics phobia. This finding challenges the common belief that mathematics phobia affects males and females differently. Still, it's important to note that the study had some limitations, such as a lack of diversity in the sample. Overall, the findings add to the existing research on mathematics phobia and gender differences

Some studies that support the findings include those by Zixi and Ling (2020), Sousa and Amaral (2019), and Ramirez et al. (2018). These studies found similar results, suggesting that mathematics phobia does not significantly impact academic performance. However, it's important to note that these studies also had their limitations, such as small sample sizes or limited generalizability. Still, they provide additional support for the findings of this study.

CONCLUSION

The conclusion of this study revealed that mathematics phobia is a significant issue among Senior Secondary School students in Nigeria. The study found that mathematics phobia has a negative impact on academic performance and self-confidence among Nigerian Senior Secondary School students. Additionally, the study found that mathematics phobia may be more common among females than males. The study suggests that further research is needed to explore the causes of mathematics phobia and how to best address it in the Nigerian educational system.

Recommendations

The study makes several recommendations based on the findings.

1. Nigerian government, schools and school administrators, community organizations, and families should ensure the implementation of intervention programs that focus on reducing mathematics phobia and improving mathematics performance.
2. Nigerian government, schools and school administrators, community organizations, and families should increase the availability of qualified mathematics teachers and provide more resources to support mathematics education.

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