

ACTION RESEARCH ON MATHEMATICS PHOBIA AMONG SECONDARY SCHOOL STUDENTS.

Kaushik Das and Madhurima Gupta

Gobardanga Hindu College, India

kaushik.das53@gmail.com; madhurimagupta825@gmail.com

correspondence: kaushik.das53@gmail.com

<https://doi.org/10.24071/ijiet.v4i2.2610>

received 22 May 2020; accepted 3 July 2020

Abstract

The purpose of this study is to find out the causes of fear in the mathematics of eleventh-grade students and to find a solution. Action research is a method that has proven to be valuable as a problem-solving tool. It can provide opportunities for reflection, improvement, transformation, and solutions to learning. The idea for this project began as a discussion among the Mathematics Phobia at Secondary school in West Bengal followed by WBCHSE Curriculum. The researchers investigate several dimensions of Mathematics Phobia. Several research questions stand out: a) Find out how much is an error in the curriculum? b) Finding students' lack of interest in learning mathematics? c) Find out how students' attitudes toward teaching methods and d) Find out Error in the learning process. The idea for this project began as a discussion among the Mathematics Phobia at Secondary school in West Bengal followed by WBCHSE Curriculum. The researchers selected 50 students from the 11th-grade class, of which 32 were male and 18 are female. Researchers formulated 12 questions and four Hypotheses. The methodology of the study is a mixed type involving interpretative, analytical study of documents, interview, survey questionnaire, observation, qualitative and quantitative data analysis, and study secondary sources, like books, university news, expert opinion, articles, journals, thesis and websites, etc. This study researcher using statistical method percentage & bar-graph & finally, meaningful suggestions are offered.

Keywords: action research, causes of mathematics phobia, innovative approaches, mathematics phobia, mathematics education, remedies of mathematics phobia

Introduction

The mathematical phobia is an obstacle to academic progress, whose reasons are very important to inquire into but are not always possible to do. This fear is expressed in the students of mathematics class and it is revealed in the standard of improvement of the students. Depending on the Phobia of mathematics, the teaching methods of teachers, teacher-student relationships, use of abusive words, etc. (Nwoke, 2016). It can be said that the mathematics of the Basic Education

Core curriculum is very important for the development of the human mind. It enables a person to think logically and systematically, analyze various problems or situations, anticipate, plan, make decisions, solve problems, and apply mathematics in everyday life. Mathematics is the means of sharpening the individual's mind, shaping his reasoning ability and developing his personality, hence, its immense contribution to the general and basic education of the people of the world (Asiedu-Addo and Yidana, 2000). This classroom action study is a very useful tool for teaching students to effectively overcome the fear of mathematics and to teach teachers most effectively. Mathematics encourages the practice of self-reliance and helps students think about their problems and solve them (Adedayo; 1997). Mathematics has played an important role in the development of society from pre-historic times until today and its role is more important than ever and more important in the future (Makarfi, 2001). Negative beliefs about mathematics affect the teachers' response to the helplessness they have learned from the students, and on the other hand, which they believe can be successful in mathematics as a result of successful mathematics experiences (Karp, 1991). Teachers' beliefs play an important role in mathematics that has a powerful impact on teaching practice (Charalambos, Philippou & Kyriakides, 2002; Ernest, 2000). Mathematics-anxiety is not a separate condition but it is—"construct with multiple causes and multiple effects interacting in a tangle that defies simple diagnosis and simplistic remedies" (Martinez & Martinez, 1996, p.2; Bessant, 1995). Negative sources of faith and math anxiety can be divided into three categories: The origins of negative beliefs and Mathematics-anxiety can be classified into three categories: a) environmental, b) intellectual, and c) personality factors (Trujillo & Hadfield, 1999). To help pre-service teachers overcome their negative beliefs and concerns about mathematics, an intervention is needed that helps pre-service teachers make radical changes in the nature of mathematics and the beliefs and concepts about speech (Levine, 1996). Phobia in mathematics is learned as a psychological response, and it often causes intense anxiety (Tillfors, 2003). Mathematics-laboratory makes teaching and learning activity-based and experimentation oriented from the elementary school stage to higher studies & it exhibits relatedness of mathematics concepts with everyday life in real situations (Das, 2019). This study influences the initiation of using mathematics laboratory in teaching-learning and connect with the theoretical parts. The mathematics laboratory uses a method other than the dialectic method as a platform and to have a significant impact on the technique or knowledge creation. Math lab makes teaching and learning activity-based and experimentation oriented from the elementary school stage to higher studies. Math teachers should use math lab for teaching purposes. It exhibits relatedness of mathematics concepts with everyday life in real situations. Math teachers should be trained for the use of a math lab in the class according to syllabi. The Pedagogical Approaches in Mathematics Education explores the responsibility of Mathematics Teachers & finds out the problems and challenges to integration Mathematics and Pedagogical knowledge & it reduces the problems and challenges to integration Mathematics and Pedagogical knowledge (Das, 2019). Mathematical knowledge and mathematical usage are mentioned in the syllabus,

students will get more importance in mathematics & it can connect mathematics with the use of technology, mathematics will be more appealing to students (Das, 2019). Henceforth, this interview session was conducted to investigate three types of disciplinary problems. First, it is to examine the causes of mathematics phobia. Second, it is to find out the lack of interest of students in learning mathematics. Third, it is to find out the error in the teaching process, learning process & mathematics curriculum. Last, it is to present the remedy of mathematics phobia.

Statement of the Problem

This study was aimed at examining the causes & remedy of mathematics phobia in Secondary School Students. This is an area that has been researched but the tools and techniques needed to find the truth of the research have been used. It is important to investigate and identify what affects students' phobia about mathematics and the development of their attitude. The present study was designed to search from each student the possible dislikes related to the most important school determinants of mathematics. The results of student evaluations and their impact have been considered as a consequence of the phobia of mathematics. The environment and teaching methods suitable for mathematics education are of particular importance. The appropriate curriculum in mathematics emphasizes the necessary technology and the interest of students, who fear math concepts.

Population and Sample

The population of interest for this study consisted of 11th standard students from Bidhannagar Municipal School followed by WBCHSE Curriculum located in Bidhannagar, Kolkata. This study areas of emphasis include teacher preparation, coaching and mentoring in-service teachers, on-line learning among practicing teachers, technology-supported classroom instruction, problem-based learning, curriculum development, Student motivation, teaching-learning process, teaching process & teacher quality for K-11 mathematics.

Purpose of the Study:

The importance of this study is that it will help to identify the causes & remedy of mathematics phobia in Secondary School Students. Researchers identify the causes of mathematics phobia. Finally, the researchers recommend a remedy for those that will read and implement the work.

Method

The sources of data gathered in the present study are surveys, published online action research work, and interviews. The current document-based analytical approach is employed for data analysis. Historical and sociological approaches have also been adopted for analyzing the collected data. The methodology of the proposed study is based on the quantitative analytical document-based & statistical analysis has been furnished.

Methodology Employed

It is based on qualitative & quantitative research. It has the chief characteristics of recent document & data based analytical research.

Research Materials

1. Questionnaires
2. Government documents
3. Peer reviewed Journals
4. Books
5. Magazines
6. On-line documents from some relevant and reliable internet sources.

Findings and Discussion

Findings

1. Research plan
Researchers have structured this action research into several steps:
Step: 1. The attitude of improving the mathematics of the school students has been observed.
Step: 2. Identifying the research problem or question.
Step: 3. Select the probable causes of mathematics phobia among children.
Step: 4. Formulation of Hypothesis.
Step: 5. Formulation of Research Questions.
Step: 6. Gathering the necessary information.
Step: 7. Analyzing and interpreting the information.
Step: 8. Give meaningful suggestions.
2. The probable causes of mathematics phobia among children are as follows
 - a. Error in curriculum.
 - b. Poor economically status of students.
 - c. Lack of mental ability in comprehending the mathematical concepts.
 - d. Error in teaching process.
 - e. Lack of technologies.
 - f. Error in learning process.
 - g. Biased evaluation procedure.
 - h. Lack of interest of students in learning mathematics.
 - i. Ineligibility to demonstrate the lesson in an appropriate manner.
 - j. Lack of learning environment.

Among the aforesaid probable causes the following causes are considered for research purpose. Researchers pickup four most causes for Mathematics Phobia & these are:

- a. Error in curriculum.
- b. Lack of interest of students in learning mathematics.
- c. Error in teaching process.

d. Error in learning process.

The following hypothesis was formulated for the study.

H₀: There is no significant difference between Mathematics Curriculum & Learning.

H₁: There is no significant difference between students' interest & learning mathematics.

H₂: There is no significant relationship between teaching process & mathematics phobia.

H₃: There is no significant relationship between learning process & students' achievement.

3. Sample of Data

For this research 50 students of Bidhannagar Municipal School are taken and the research is conducted on them.

4. Tools of the Study

Based on the hypothesis formulated 12 questions are made. This information is collected based on those questions. So, in this case, questionnaires are considered as the tool of study. The questions based on hypothesis are as follows:

12 questions were created based on the Hypothesis made by the Researchers. Data was collected from the students through this questionnaire. Thus, the questionnaire has been used as a data collection tool. The following Hypothesis - based questions are given in the following table:

Table 1. Formulation of Hypothesis and Research Questions

Formulation of Hypothesis.	Questions.	No. Of Questions.
H ₀ : There is no significant difference between Mathematics Curriculum & Learning.	The syllabus of mathematics is huge. So, I fear studying mathematics. The procedures are not properly explained in our Mathematics book.	2
H ₁ : There is no significant difference between students' interest & learning mathematics.	I am not interested in understanding mathematical concepts and ideas. I do not feel the urge to practice the sums which are done in school at home. Teacher cannot explain the concepts properly. Teacher does not use Black-board, charts & other teachings Aids to make the students understand the mathematical concepts.	2
H ₂ : There is no significant relationship between teaching process & mathematics phobia.	Teachers do not ask us any questions while teaching. Teacher do not behave with us in a friendly manner.	6

	I am afraid of my mathematics teacher.	
	The teacher do not arrange any quarries or enquiries.	
H ₃ : There is no significant relationship between learning process & students' achievement.	I cannot remember the formulae. I try to memorize all the sums without understanding the concepts.	2

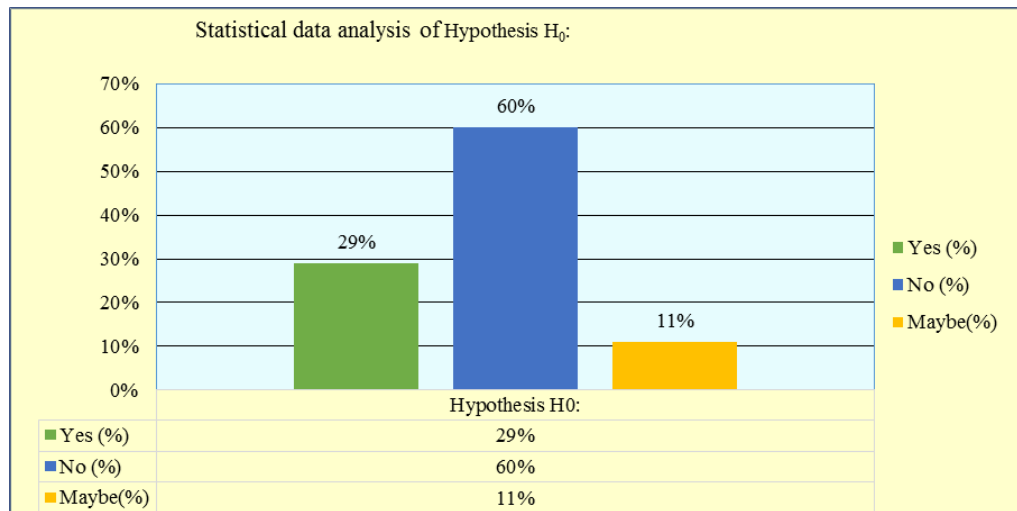
Table 2. Students' opinion on the basis of questionnaire

Sl. No.	Questions.	Yes. (%)	No. (%)	No reply. (%)
1.	The syllabus of mathematics is huge. So, I fear studying mathematics.	10	88	02
2	The procedures are not properly explained in our Mathematics book.	48	32	20
3	I am not interested in understanding mathematical concepts and ideas.	0	100	0
4	I do not feel the urge to practice the sums which are done in school at home.	20	80	0
5	Teacher cannot explain the concepts properly.	10	84	06
6	Teacher does not use Black-board, charts & other teachings Aids to make the students understand the mathematical concepts.	42	54	04
7	Teachers do not ask us any questions while teaching.	04	94	02
8	Teacher do not behave with us in a friendly manner.	06	90	04
9	I am afraid of my mathematics teacher.	30	60	10
1	The teacher do not arrange any quarries or enquiries.	60	24	16
1	I cannot remember the formulae.	88	12	0
1	I try to memorize all the sums without understanding the concepts.	72	28	0

Hypothesis H₀:

Analysis of students' opinion on the basis of hypothesis: H₀: There is no significant difference between Mathematics Curriculum & Learning.

	Yes (%)	No (%)	Maybe (%)
Hypothesis: H ₀	$\frac{10 + 48}{2} = \frac{58}{2} = 29$	$\frac{88 + 32}{2} = \frac{120}{2} = 60$	$\frac{02 + 20}{2} = \frac{22}{2} = 11$



Bar-graph 1: Analytical result with respect to Hypothesis H₀.

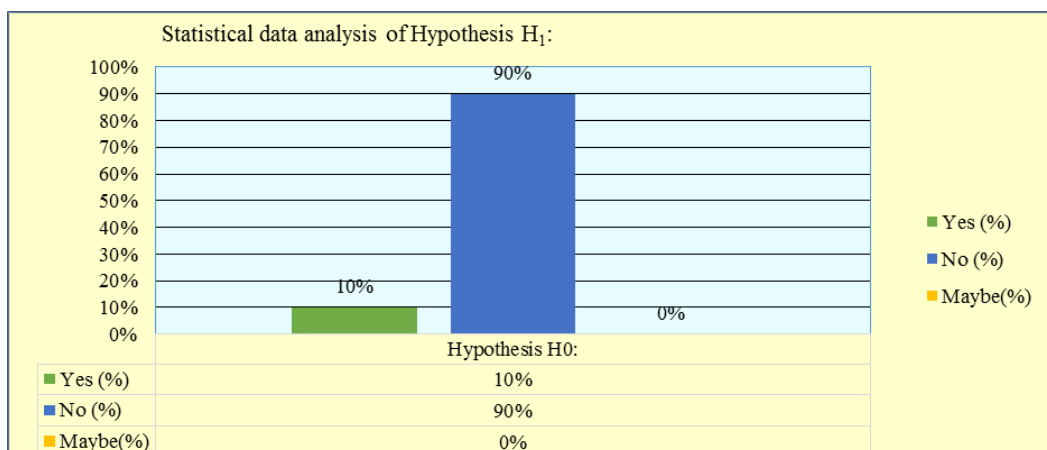
Interpretation of Hypothesis H₀:

From the above analysis, we can conclude that most of the students do not think that mathematics phobia among them is due to errors in the curriculum. So the hypothesis H₀ is acceptable.

Hypothesis H₁:

Analysis of students' opinions based on hypothesis H₁: There is no significant difference between students' interest & learning mathematics.

	Yes (%)	No (%)	Maybe (%)
Hypothesis H ₁	$\frac{0 + 20}{2} = \frac{20}{2} = 10$	$\frac{100 + 80}{2} = \frac{180}{2} = 90$	$\frac{0 + 0}{2} = 0$



Bar-graph 2: Analytical result with respect to Hypothesis H₁

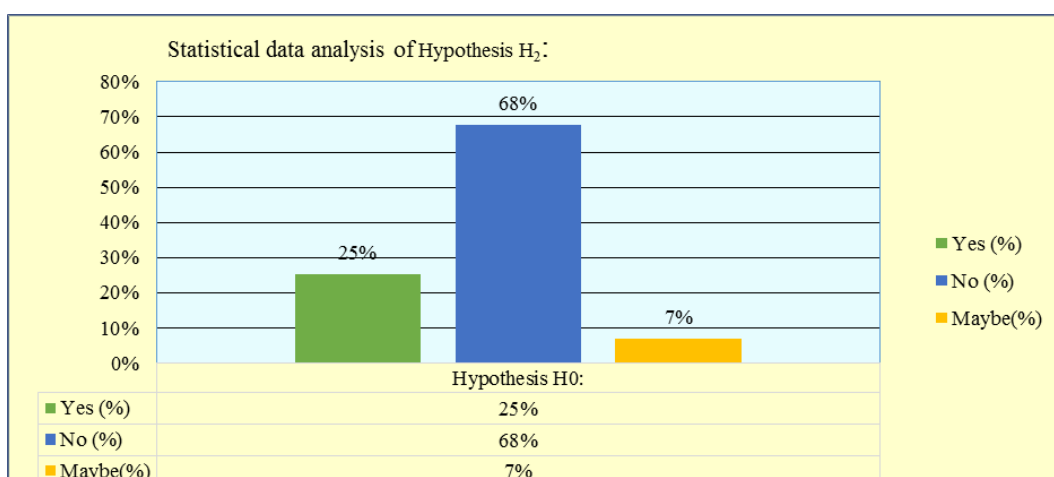
Interpretation of Hypothesis H₁:

From the above analytical table researcher conclude that most of the students do not feel that the students' interest & learning mathematics is not the cause of mathematics phobia among students'. So this particular hypothesis is acceptable.

Hypothesis H₂:

Based on students' opinion the hypothesis H₂: There is no significant relationship between teaching process & mathematics phobia.

	Yes (%)	No (%)	Maybe (%)
Hypothesis H ₂ :	$\frac{10 + 42 + 4 + 6 + 30 + 6}{6} = \frac{152}{6} = 25.33$	$\frac{84 + 54 + 94 + 90 + 60 + 2}{6} = \frac{406}{6} = 67.67$	$\frac{6 + 4 + 2 + 4 + 10 + 16 + 6}{6} = \frac{42}{6} = 7$



Bar-graph 3: Analytical result with respect to Hypothesis H₂

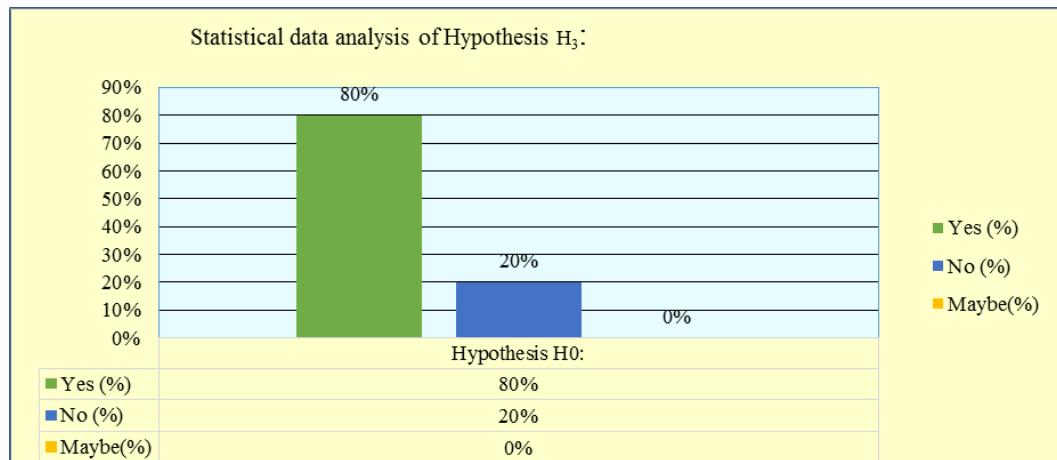
Interpretation of Hypothesis H₂:

From the above results, the researcher concludes that most of the students do not agree that teaching process & mathematics phobia are not related. So the hypothesis H₂ is acceptable.

Hypothesis H₃:

Analysis of students' opinions based on hypothesis H₃: There is no significant relationship between the learning process & students' achievement.

	Yes (%)	No (%)	Maybe (%)
Hypothesis H ₃ :	$\frac{88 + 72}{2} = \frac{160}{2} = 80$	$\frac{12 + 28}{2} = \frac{40}{2} = 20$	$\frac{0 + 0}{2} = 0$



Bar-graph 4: Analytical result with respect to Hypothesis H₃

Interpretation of Hypothesis H₃:

From the above analysis, the researcher concludes that most of the students think that the learning process & students' achievement is the cause of mathematics phobia. So the hypothesis H₃ is rejected.

Discussions

1. Students do not think about the curriculum as much as it creates fear among them about mathematics. So students do not support this reason.
2. Lack of explanation for learning mathematics is felt by students in mathematics books.
3. Students are keen enough to understand the concept of mathematics.
4. Although the teacher satisfactorily explains the concept of mathematics but he does not use enough blackboards and teaching materials (TLM).
5. The teacher's friendly relationship with the students does not in any way scare the teacher.
6. The teacher asks students subjective questions while teaching in the classroom.
7. Students memorize formulae and theories without understanding mathematics. Cannot use required formulae and cannot remember formulae when applying mathematics.

Recommendations

1. Mathematics teachers must use the mathematics laboratory as well as the organization.
2. The teacher will make the math subject easier by Math-game.
3. The necessary remedial classes will be arranged for the weaker students.
4. Needs to action research activity at school.

5. Math teachers should try to make student active and motivated during mathematics classes.
6. Teacher must use different ways all method of teaching.
7. Teacher should clear doubts in classroom itself.
8. Teacher should give daily life examples while teaching.
9. Teacher should take revision after teaching topics.
10. Students shoot habit of practicing sums and doing homework regularly.
11. Teacher should use appropriate teaching skills.
12. School should be arrange workshop.
13. The future researcher should conduct classroom action research for teaching other subjects and other levels of education such as primary schools, college and universities. Also, they should make an in-depth observation in a classroom for obtaining more details. In the future, we shall extend our study to higher education levels for mathematics education.

Conclusion

This study contextually specifies teaching and learning strategies for teachers to develop a deep understanding of students' lessons. This study shows that attitude towards mathematics phobia and its causes are significantly and positively correlated, both for boys and girls. Behaviours that are friendly and concerned about such students provide the positive emotional and motivational conditions necessary for depth learning. Although the mathematics curriculum is high, students are not worried about it but are not satisfied with the proper interpretation of mathematical problems, formulae and theories in the book. For future mathematicians and problem solvers in India, the school also needs to look at mathematics education. The present study shows that mathematics phobia is due to memorizing the formulae and lack of understanding of the concepts.

References

- Adedayo, O. (1997). *Mathematics phobia, diagnosis and prescription*. National Mathematical Centre 1st Annual Lecture, Abuja.
- Aseidu-Addo, S.K., & Yidana I, (2000). Mathematics teachers knowledge of the subject content and the methodology. *Journal of the Mathematical Association of Ghana*, 12.
- Bessant, K. (1995). Factors associated with types of mathematics anxiety in college students. *Journal for Research in Mathematics Education*, 20(4), 327-345.
- Charalambos, C., Philippou, G., & Kyriakides, L. (2002). Towards understanding teachers' philosophical beliefs about mathematics. Paper presented at the International Group for the Psychology of Mathematics Education (PME), Norwich UK.

- Das, K., & Chowdhury. R. (2019). Analytical study on practice teaching of B.Ed. Students in B.Ed. department, Gobardanga Hindu College, under WBSU in India. *International Journal of Scientific Research and Reviews*, 8(2), 3882-3898.
- Das, K., & Roy, D. (2019). Infrastructural facility faced by trainee teachers in new two years B.Ed. Programme in West Bengal. *International Journal of Research in Social Sciences*, 9(7), 210-222.
- Das, K. (2019). Lack of mathematical knowledge in two-year B.Ed. programme: Indian Context. *Research Journal of Educational Sciences*, 7(3), 1-6.
- Das, K. (2019). Pedagogical approaches in mathematics: Indian perspectives and practices. *International Journal of All Research Writings*, 1(3), 16-21.
- Das, K. (2019). Role of ICT for better mathematics teaching. *Shanlax International Journal of Education*, 7(4), 19-28.
- Das, K. (2019). Significant of mathematics laboratory activities for teaching and learning. *International Journal on Integrated Education*, 2(5), 19-25. Retrieved from <http://journals.researchparks.org/index.php/IJIE/article/view/127>.
- Das, K. et al. (2019). Applications of mathematical knowledge in history, geography, fine-arts & physical education subjects in two-year B.Ed. program: Indian context. *Journal of Emerging Technology and Innovative Research*, 6(6), 8-15.
- Das, K., Roy, D., & Biswas, P. (2019). SWOT analysis of teacher educators in B.Ed. department under West Bengal State University in West Bengal, India. *Research Review International Journal of Multidisciplinary*, 4(6), 2455-3085.
- Ernest, P. (2000). Teaching and learning mathematics. In V. Koshy, P. Ernest, & R. Casey (Ed.), *Mathematics for primary teachers*. London, UK: Routledge.
- Ihechukwu, B. N., & Ugwuegbulam, N. C. (2016). Causes and solutions of mathematics phobia among secondary school students. *Research on Humanities and Social Sciences*, 6(20), 105-109.
- Karp, K. S. (1991). Elementary school teachers' attitudes toward mathematics: The impact on students' autonomous learning skills. *School science and mathematics*, 91(6), 265-270.
- Levine, G. (1996). Variability in anxiety for teaching mathematics among pre-service elementary school teachers enrolled in a mathematics course. Retrieved 12 September, 2003, from <http://gateway.library.qut.edu.au:2127/Webstore/CommonSearchResults.asp?>
- Makarfi, U.M. (2001). Keynote address delivered at the opening ceremony of the 30th Annual Conference of Mathematical Association of Nigeria Held in Kaduna.
- Martinez, J. G. R., & Martinez, N. C. (1996). *Math without fear*. Needham Heights, MA: Allyn and Bacon.

- Okigbo, E.C. (2010). Comparative effectiveness of mathematical game and instructional analogy as advance organizers on students achievement and interest in mathematics. Unpublished Doctorial Dissertation, Nnamdi Azikwe University, Awka, Nigeria.
- Tillfors, M. (2003). Why do some individuals develop social phobia? A review with emphasis on the neurobiological influences. *Nord Journal of Psychiatry*, 58(4).
- Trujillo, K. M., & Hadfield, O., D. (1999). Tracing the roots of mathematics anxiety through in-depth interviews with preservice elementary teachers. *College Student Journal*, 33(2), 11.