Journal of Positive School Psychology http://journalppw.com
2022, Vol. 6, No. 6, 8323-8328

The Initial Investigation of Mathematical Anxiety & Phobia: It's Solution in Middle School Students

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Abstract:
Mathematical anxiety, commonly referred to as simply "Math Phobia," is indeed an anxiety about not being able to do math in a variety of households and middle schools. Math anxiety stems from various factors. In recent years, many psychological and educational researchers have focused on math anxiety. Mathematics anxiety and phobia are broad terms which include a wide variety of symptoms and behaviors. Besides that, in many ways, mathematics anxiety is simple to describe and define: it is the anxiety that some people experience when faced with mathematical problems. The aim of this research is to measure the level of mathematical anxiety among middle school students. Based on the correlation and standard deviation, we implemented two groups of twenty middle school students in Delhi to explore a teaching approach to diminish math phobia amongst middle school students. This study advocated that the level of mathematics anxiety among middle school students was interpreted as moderate anxiety.

Keywords-Mathematics Anxiety, Math Phobia, Correlation, Hypothesis Test

Introduction

Mathematical anxiety, often known as Math phobia, is the fear of not being able to do the math. Anxiety over math originated long before it was studied. Because of their performance, some pupils have experienced anxiety when faced with mathematics challenges. Anxiety, on the other hand, can be caused by a variety of factors. For many kids, mathematics is as ferocious as a devil. As soon as they open the Mathematics book, many students fall asleep. Their maths score is very low. They simply give up and claim that they are unable to complete the task. Unfortunately, avoiding math leads to a lack of ability, exposure, and practice, making pupils more worried and mathematically unprepared to achieve their learning objectives. Math phobia is the effect of this feeling of panic. A sensation of stress, concern, or fear that interferes with math performance is known as math phobia. An individual with math phobia does not necessarily lack mathematical ability; rather, the interfering symptoms of anxiety prevent him or her from performing to his or her full potential.

Math phobia is learned via parents and educators rather than through first-hand experience, according to various specialists. Whenever parents with high mathematics anxiety want to assist their children with schooling, sometimes unknowingly communicate the information to their children that math is difficult and anxious. Math phobia is commonly developed in students at school in terms of learning from instructors who are already suffering from the illness. Such teachers are prone to teaching solely from a textbook, relying on facts to be memorized, and relying on drills and repetition to reinforce the lesson.

According to the study, exam and test pressure, as well as the possibility of public disgrace, are the primary drivers of unproductive anxiety among several students. Sanctioned authority, communication, and time constraints are all characteristics that are prominent in mathematics teaching and produce a lot of anxiety amongst learners.

Math is sometimes introduced as little more than a basic subject, with acceptable and unacceptable answers. Teachers require students to respond in a specific way, and in some situations, this rigidity is so extreme that students are still unable to express themselves in their special manner. As a result, psychologists have determined the rote method of learning. Mathematical anxiety, often known as math phobia, is the fear of not being able to do the math. Anxiety over math originated long before it was studied. Because of their performance, some pupils have experienced anxiety when faced with mathematics challenges. Anxiety, on the other hand, can be caused by a variety of factors.

Dodd (1992) encourages educators to be more knowledgeable about math anxiety, which would ideally contribute to an active conversation over how to fulfil the students' expectations. Mathematics anxiety, according to Lyonsand

Beilock (2012), is characterized by emotions of anxiety, trepidation, and panic when studying math. According to Malinky et al. (2006), math anxiety is a very widespread problem among today's college students. According to the authors, university and school students today frequently experience math anxiety. One of the primary skills required to function in everyday life, especially in modern civilizations, is mathematics, which enables one to meet the obstacles of daily life.

Literature review

As a kind of anxiety that is subject-specific, has been proposed by Dreger and Aiken (1957). The attitudes of secondary school students toward learning geometry are examined by Jain D.K. (1979). The researcher used a quantitative and descriptive survey strategy for this investigation. Singh et al. (1986) founded students attitudes toward mathematics to be related to their mathematical achievement.Wigfield et al. (1988) investigated mathematics anxiety is very common among college students. According to several surveys, the majority of Malaysian students. Gardener and Tamir (1989) investigated a term 'interest' refers to a preference for certain types of activities over others. When we are interested in a particular phenomenon. Spielberger et al.(1995) explained that anxiety is defined as a psychological and physical response to a self-concept characterised by subjective, consciously perceived feelings of tension.Ostler et al. (1998) explained mathematics teachers improve their students instruction by avoiding several mistakes during developing curricula. These mistakes include relying too heavily on textbooks and their content sequencing, failing to apply math to real-world situations, separating assessment and technology from instruction, and adhering too closely to any single methodology. Different teaching styles must also be acknowledged.

Hourcade et al. (2001) proposed that collaboration between two or more instructors with different and complementary sets of key expertise. Vinson (2001) investigated that there isn't a universal agreement among scholars regarding work, including its concepts, aspects, motivations, and impacts and was quoted as saying, "Mathematics anxiety is little more than a fear of mathematical concepts.

Li (2003) identified the math terrifies a lot of grownups. Generally, early school experiences can be connected to the development of this syndrome. Thomas et al. (2003) studied and investigated two mythologies: the first is that advanced level math is tricky for those who are already intelligent to master, and the other one is that without mathematics. Willcox et al. (2004) concluded that math difficulties, the flow of learning and application, as well as mathematical concepts, are important in the core undergraduate engineering curriculum. Pan and Tang (2005) looked into a significant problem in a woman's elementary and secondary education programmes, researcher received advice to steer clear of math-related work wherever feasible. According to Malinky et al. (2006), Math anxiety is a very widespread issue among college and university students. Woolfolk (2007) recommended that teachers assist their pupils by (a) lowering or removing time and other pressures in mathematics-related activities, (b) providing that instructions are clear, and (c) decreasing Math performance's competitiveness factors.

According to Ruffin et al. (2007), anxiety disorders exhibit a defeatist mentality towards school education, as seen by a lack of enthusiasm in studying, poor exam performance, and unsatisfactory task productivity. According to Baloglu and Zelhart (2007), math anxiety has been described as a distinct concept. Anderson (2007) looked into both students and faculty have observed that university graduates typically feel anxious.Knapp (2008) investigated math teaching to adults who are intimidated by said area may be effective in the short or long term. Additionally, beginning with modest mathematical triumphs can lead to immediate successes that can support habitual, negative interest in math. Cathoglu et al. (2009) investigatedIn addition to being one of the most important ideas; mathematics anxiety has had a direct or indirect impact on all aspects of mathematics education.According to Erden et al. (2010), one of the key abilities needed by people in today's society to survive in everyday life is math. Anxiety toward math may intensify according to the subject's hardness.In same time duration Vitasar et al.(2010), Birgin. et al. (2010), Nichole.et al.(2010) investigated similar work to analyses math anxiety.Hazarika (2014) conducted an assessment on the effectiveness of a questionnaire that had been used to assess the socio-economic conditions of class VIII pupils in a few Guwahati schools.

Carey et al. (2016) studied on two potential causal pathways between math nervousness and deprived maths recital.According to Dower et al. (2016), there really is a correlation between math anxiety and performance. The study reveals that physiologic signs and quizzes have been used to evaluate math anxiety.Donolato et al. (2020) investigated math anxiety by using ego-resiliency for overcome mathematics anxiety in primary and middle school students.Gabriel et al. (2020)

remarked that self-regulated learning benefits students intellectual progress, employment, and career advancement over the long term.The development and effectiveness assessment of the deep-learning lesson framework utilising a variety of approaches for elementary school math have been explored by Xie et al. in 2020.Jamieson et al. (2021) established an essential measures for comprehending the cognitive underpinnings of math and developed efficient approaches.

Objectives and Hypothesis of Research

On the basis of this literature review, we found sufficient research gap to investigate these two objectives in this study which are hereunder:

- Study the Anxiety levels of Mathematics phobia in middle school students
- Suggest the possible solution to Mathematics Phobia in middle school students.

We applied for hypothesis test to find out the solution to mathematics phobia.

H_{01}: There is no change reported in the students after five days of teaching with different Methods

H_{a1}: There is change reported in the student after five days of teaching with different methods

Research Methodology

In this work, we used a descriptive and experimental type of research methodology. The first objective is achieved based on a secondary data which was taken from previously research work related to the anxiety level of mathematical phobia and also investigated various types of anxiety levels from the student based on qualitative interviews but levels are to be defined from the basis of secondary information. For the secondary objective, we collected data from two groups of students located nearby their colony. Both groups of students belong to the fourth standard in Delhi and have the same number of students (five students in each group). To check the mathematical phobia, we gave five questions of mathematics to both the groups belonging to Algebra, Average, LCM, SUM, and Multiplication. These questions are given to students without informing any type of such test information. After giving these questions the researcher observe these students and asked Four questions from both groups in 'Yes', 'No', and 'I don't understand' format these four questions:

Q1: Does this surprise test give you any tension?

Q2: Do you feel mathematics is a difficult subject?

Q3: Do you require more practice in mathematic?

Q4: Is your mathematics tuition teacher not able to teach you well?

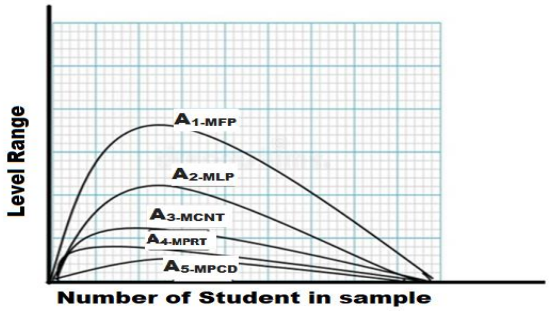
After this small test of mathematics, the we gave tuition to both the groups in two different styles only for five days. One group of students teaches mathematics with traditional methods (teach from subject book examples) and another group of students teaches with practical methods (based on real-life examples). After giving five days of tuition then we asked again these four questions and tried to check the difference between both the groups' outcomes. This analysis is competed by conducting correlation test and Excel used as a tool.

Result Analysis based on objectives

The first objective of this present study was achieved based on secondary data sources related to the Anxiety levels of Mathematics phobia in middle school level students. Various types of anxiety levels were reported in school level students which were related to Mathematical Phobia

1. *Anxiety Level One:* Students are not interested to learn mathematics due to mathematical formula phobia. Various types of the study conducted in western countries said 30 to 40 % of students have mathematical formula phobia.
2. *Anxiety level Two:* Students are not able to understand the logic behind the mathematical concept or we say they have analytical thinking problems. This issue was also considered and investigated by many previously researchers.
3. *Anxiety Level Three:* Various teachers reported that in-class students avoid taking mathematics classes and also do not complete homework on time. Most of the time female students have such problems. Various researchers reported that five to ten percent of students show such a kind pattern in class.
4. *Anxiety Level Four:* This type of anxiety is not reported on the side of the student, they are reported on the side of the teacher. Because the various study reported that teachers are not well trained or do not update themselves according to the requirement of modern school teaching in the field of mathematics.
5. *Anxiety level Five:* It's a kind of cognitive disorder that was reported in the student. In these cases, students sometimes behave very well related to the Mathematical Phobia and sometimes behave based on the above anxiety level.

Fig. 1 *Graphical representation of the analysis Shows*



Graphical representation of five types of Anxiety level based on qualitative interview of the domain and level is to be set on a range of 10 point.

Coding of Anxiety Level
Anxiety Level One = $A_{1\text{-MFP}}$
Anxiety Level Two = $A_{2\text{-MLP}}$
Anxiety Level Three = $A_{3\text{-MCNT}}$
Anxiety Level Four = $A_{4\text{-MPRT}}$
Anxiety Level Five = $A_{5\text{-MPCD}}$
$A_{1\text{-MFP}} > A_{2\text{-MLP}}$

$[(A_1 - \text{MFP}) > (A_2 - \text{MLP}) > (A_3 - \text{MCNT}) > (A_4 - \text{MPRT}) > (A_5 - \text{MPCD})]$

The analysis of the first objective shows that the level of mathematical formula phobia is very high as compared to other levels of mathematical phobia. So the school gives more focus on formula phobia solutions. This key solution improves the level of a student toward mathematical phobia.

Table 1: *Outcome before training of above mention questions coding for analysis: Yes = 1, No = 2 and I don't understand = 3*

Group-A outcome before training	S-1-G-1	S-2-G-1	S-3-G-1	S-4-G-1	S-5-G-1
Q1	1	1	1	2	2
Q2	2	1	1	1	1
Q3	1	2	1	1	2
Q4	1	1	2	1	1
Q5	1	3	1	3	1
Group-B outcome before training	S-1-G-2	S-2-G-2	S-3-G-2	S-4-G-2	S-5-G-2
Q1	1	1	2	1	1
Q2	2	1	1	2	1
Q3	1	1	1	1	3
Q4	1	2	2	1	1
Q5	2	3	1	1	2
Correlation value	0.612372	0.6875	0.612372	-0.375	0.408248
Standard deviation	0.483046	0.843274	0.483046	0.699206	0.707107

Table 2: *Outcome after given training of both the group as method given in research methodology of above mention questions*

Group-A outcome after training	S-1-G-1	S-2-G-1	S-3-G-1	S-4-G-1	S-5-G-1
Q1	2	3	3	2	2
Q2	2	1	2	1	1
Q3	3	2	3	3	3
Q4	1	3	3	3	2
Q5	3	3	3	3	1
Group-B outcome after training	S-1-G-2	S-2-G-2	S-3-G-2	S-4-G-2	S-5-G-2
Q1	2	2	2	1	2
Q2	1	1	2	2	2
Q3	2	3	2	2	3
Q4	2	2	3	2	2
Q5	2	2	3	2	3
Correlation value	0.13363062	0.39528471	0.612372	0.40824829	0.25
Standard deviation	0.666666667	0.788810638	0.516397779	0.737864787	0.737864787

We compared the value of Table 1 and Table 2 and the results are showing very appropriately that the correlation value of Table.1 is higher as compared to the correlation value of Table 2. The standard deviation of values of Table 1 is at the lower end as compared to the standard deviation value of Table 2. This means that practical methods of teaching are more effective as compared to the traditional method of teaching. So the null hypothesis is rejected and an alternate hypothesis is accepted. This means that there are changes reported in the student after five days of teaching with both methods. But as per the value of correlation and standard deviation, the practical method of teaching has a more positive outcome.

Conclusion

The initial investigation of mathematical anxiety, phobia and its solution in middle school students has been developed in this study**.** We analysed two objectives based on anxiety levels in middle school students and suggest the best solution for math phobia for students. It is concluded from the first objective that the anxiety level of the student occurs in mathematics due to mathematical formula phobia. The second outcome is that the practical method of teaching gives more positive results as compared to traditional methods of teaching. In the analysis, the level of mathematics anxiety among middle school students was interpreted as moderate anxiety.

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