International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347 -6435 (Online)), Volume 15, Issue 1, January 2026)

A Study of Mathematics Phobia among Elementary School Students and Its Causes & Contributing Factors.

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***Abstract*— Mathematics phobia is a condition characterized by persistent fear, anxiety, and avoidance of mathematics-related activities, and it has become a major obstacle to effective educational practice at the elementary level. Early experiences with mathematics play a significant role in shaping students' attitudes, which not only affect academic performance but also long-term educational outcomes. Despite the importance of mathematics, many elementary-level students experience fear and anxiety related to mathematics, which is known as Mathematics phobia. This condition often leads to avoidance of mathematical tasks, low self-confidence, and poor academic performance. The aim of this study was to assess the level of Mathematics phobia among elementary school students, to study the differences based on gender and school type, and to identify the causes of this phenomenon. A descriptive survey method was adopted in the study. The sample consisted of 160 students of classes VII and VIII of government and private schools in Bhopal, Madhya Pradesh, in which there were equal numbers of boys and girls students.**

Data were collected using the Mathematics phobia Questionnaire (MPQ), which was developed by the researcher, while semi-structured interviews were also conducted to better understand the students' experiences and perceptions. The results showed that the students in the sample had moderate levels of Mathematics phobia: 25% of the students had above-average phobia, 50% had average levels, and 25% had below-average phobia. Statistical analysis revealed that there was no significant difference in Mathematics phobia between boys and girls students, indicating that both genders were equally affected at this level. However, significant differences were found by school type, with students in government schools having higher levels of Mathematics phobia than those in private schools. The interviews revealed that the main causes of Mathematics phobia included low self-esteem, phobia of making mistakes, uniform and teacher-centered teaching methods, test pressure, and negative previous experiences with teachers. This study emphasizes the importance of timely identification and intervention of Mathematics phobia. It highlights the importance of supportive teaching methods, teacher training, and student-centered teaching strategies to promote positive attitudes toward mathematics and improve academic outcomes.

***Keywords*—Mathematics phobia, Elementary school students, Government and private schools, Causes & Contributing Factors.**

I. INTRODUCTION

Education is a process through which the human personality develops and gets rid of all the problems and sufferings. Education has always given a better standard of life to a person. It is a process that continues from birth to old age (Dewey, 1938). Mutual brotherhood, peace, harmony, helping each other, moral values, etc. All these qualities are achieved through education. A person who is not enlightened by the light of education is blind even after birth because education nurtures a person from the mother and gives correct guidance from the father (Swami Vivekananda, 1996). Through education, you help an individual develop important skills like decision-making, mental agility, problem-solving, and logical thinking (NCERT, 2020). People face problems in their professional and personal lives. In such situations, their ability to make rational and informed decisions comes from how educated they are. Through education, we can achieve anything. Education is a systematic process through which a child or student acquires knowledge, experience, skills, and the right attitude. It makes an individual civilized, better, honest and educated (Bruner, 1966). Mathematics is a cornerstone of education, essential for developing critical thinking and problem-solving skills. Mathematics is the knowledge in which correct reasoning and estimates are based on numbers and formulas. It is a very important subject that plays a prominent role in school education, science and technology (Cockcroft, 1982). Mathematics is an expression of human thought that reflects logical reasoning and aesthetic taste. Its basic elements include logic, prediction, analysis, construction and uniqueness. Modern mathematics includes subfields such as arithmetic, algebra, geometry and analysis, which are used in natural sciences, engineering, medicine, finance, computer science and social sciences (Skemp, 1987).

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Although mathematics is used to explain phenomena, its fundamental truths do not require any scientific experiment. Nevertheless, many elementary school students suffer from fear of mathematics, which results in avoidance, fear and poor academic performance (Ashcraft & Kirk, 2001).

This study examines the causes, manifestations and possible solutions of fear of mathematics in order to improve students' educational experiences. Math fear is caused by a variety of factors, including ineffective teaching methods, negative educational experiences, an overemphasis on exams, and a societal perception of math as a difficult subject. It is crucial to understand math fear at an early stage, as these experiences influence students' attitudes and achievement in the future.

Mathematics is a fundamental subject in the school curriculum and plays a crucial role in the development of logical thinking, problem-solving skills, and everyday decision-making. Despite its importance, mathematics is often perceived by students as difficult, abstract, and intimidating. This perception leads many learners to experience fear, anxiety, and avoidance related to mathematics, a condition commonly referred to as mathematics phobia.

Mathematics phobia is characterized by feelings of tension, worry, and helplessness that interfere with the effective learning and performance of mathematical tasks. At the elementary level, such fear can develop due to early learning experiences, repeated failure, fear of making mistakes, or negative classroom environments. If not addressed at this stage, mathematics phobia may persist into later years of schooling and adversely affect students' academic achievement, self-confidence, and career choices.

Elementary school years are critical for forming positive attitudes toward mathematics. During this stage, students begin to build foundational concepts that influence their future learning. However, factors such as unengaging teaching methods, lack of individual attention, pressure to perform, and negative interactions with teachers or peers can contribute to the development of mathematics phobia. Emotional factors like low self-confidence and fear of failure further intensify the problem.

Understanding the prevalence of mathematics phobia and identifying its causes and contributing factors is essential for improving mathematics education. By examining both emotional and instructional aspects, educators and policymakers can design effective strategies to reduce anxiety and promote a supportive learning environment.

Therefore, the present study aims to investigate the level of mathematics phobia among elementary school students and explore the major causes and contributing factors associated with it.

II. Review Of Related Literature

In an early study, **Mayana (1996)** researched the factors related to the mathematical achievement of elementary school students. This study demonstrated that the nature of mathematics, teaching methods and students' perceptions and perceptions have a significant impact on mathematics achievement. This study formed the basis for subsequent studies that focused on emotional and cognitive barriers to learning mathematics.

Kunwar (2010) studied Mathematics Phobia: Causes, Symptoms, and Ways to Overcome Them. This study identified negative attitudes, fear of failure and unfavorable educational experiences as the main causes of mathematics fear.This research aimed that if teachers understand mathematics fear better, they can play an effective role in guiding students to overcome this fear.

Kasia (2011) investigated the Mathematical Achievement of Senior elementary School Students in Relation to Academic Anxiety. The results showed that there is a negative relationship between academic anxiety and mathematics achievement, i.e. the higher the anxiety, the lower the performance in mathematics.

Mustaq (2013) studied Mathematics Achievement among High School Students in Afghanistan. This research aimed to explore the mathematical achievement of high school students, indicating that the performance in mathematics differs significantly between boys and girls, with girls achieving less than boys.

Owerri (2016) researched the Causes and Solutions of Mathematics Phobia Among elementary School Students. This study found that teacher-related factors, such as strict attitudes, ineffective teaching strategies, and lack of motivation, play a significant role in instilling mathematics fear in students.

Pandey (2017) conducted a study on the topic of mathematical achievement among elementary school students. The purpose of this research was to examine the mathematical achievement of elementary school students based on gender and social affiliation. However, no significant differences were observed in mathematics achievement between based on gender and social affiliation.

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Agulanna and Maduagwumu (2020) conducted a study on "Gender Stereotype Threat And Mathematics Achievement Among The elementary School Students. The results showed that there was a negative relationship between stereotype threat and mathematics achievement, with girls experiencing higher levels of this stress than boys.

McIntyre, Paulson, and Lord (2021) studied "Alleviating Women's Mathematics Stereotype Threat through Salience of Group Achievements." This research aimed to understand how alleviating women's mathematics stereotype threats can lead to improvements in group achievements. The study found that when women were exposed to positive group performance, their confidence increased and they performed better on difficult mathematics questions. This suggests that reducing psychological stress may help reduce math anxiety.

More recent research **(Carey et al 2022, Mutlu & Akgün 2022, OECD 2023, Borba et al 2023, Zhang et al 2024)** has focused on the learning environment, teacher support, and emotional well-being. These studies found that supportive teaching practices, activity-based learning, and formative assessment significantly reduce math anxiety in early grade students. At the same time, digital and blended learning environments can reduce math anxiety in some situations, while in others, they can increase it due to students' lack of access, trust, and teacher guidance.

Overall, previous studies suggest that math anxiety is a multifaceted problem that is influenced by psychological factors (such as anxiety, fear, and self-esteem), social factors (such as gender stereotypes and parental support), and pedagogical factors (such as teaching methods and teacher attitudes). Although extensive research is available on this topic, However, there is still a need for contemporary studies focused on elementary school students to identify trends in mathematics fear and effective intervention strategies in the current educational context. The present study attempts to fill this gap by analyzing the prevalence and causes of mathematics fear among elementary school students.

Research Gap:

While studies address mathematics anxiety and achievement, few focus specifically on **mathematics phobia at the elementary level in India**, particularly comparing government and private schools. This study addresses that gap.

III. Objectives Of The Study:

1. To find out the level of Mathematics phobia among elementary school students.
2. To identify differences in Mathematics phobia between male and female students.
3. To find out the level of Mathematics phobia between from government and private schools.
4. To identify the causes of mathematics phobia among elementary school students.

IV. Hypotheses

H1: The level of mathematics phobia among elementary school students is average.

H2: There is no significant difference in Mathematics phobia between male and female students.

H3:There is no significant difference in Mathematics phobia between government and private schools.

V. Research Methodology

5.1. Research Design

This study employed a **descriptive survey design** to measure the prevalence, differences, and causes of mathematics phobia among elementary school students.

5.2. Population and Sample

The population consisted of all Grade 7 and Grade 8 students from government and private schools in Bhopal, India. A total of **160 students** were selected using stratified random sampling:

- 80 students from government schools (40 boys, 40 girls)
- 80 students from private schools (40 boys, 40 girls)

5.3. Research Tools:

1. Mathematics Phobia Questionnaire (MPQ): Developed by the researcher, containing 25 items rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Higher scores indicate higher phobia.

2. Interview Schedule: Used to collect qualitative insights on causes of mathematics phobia.

3. Procedure of Data Collection: Permission was obtained from school authorities, and data were collected during regular school hours. Questionnaires were administered collectively in classrooms. Interviews were conducted with a subset of 20 students representing different phobia levels.

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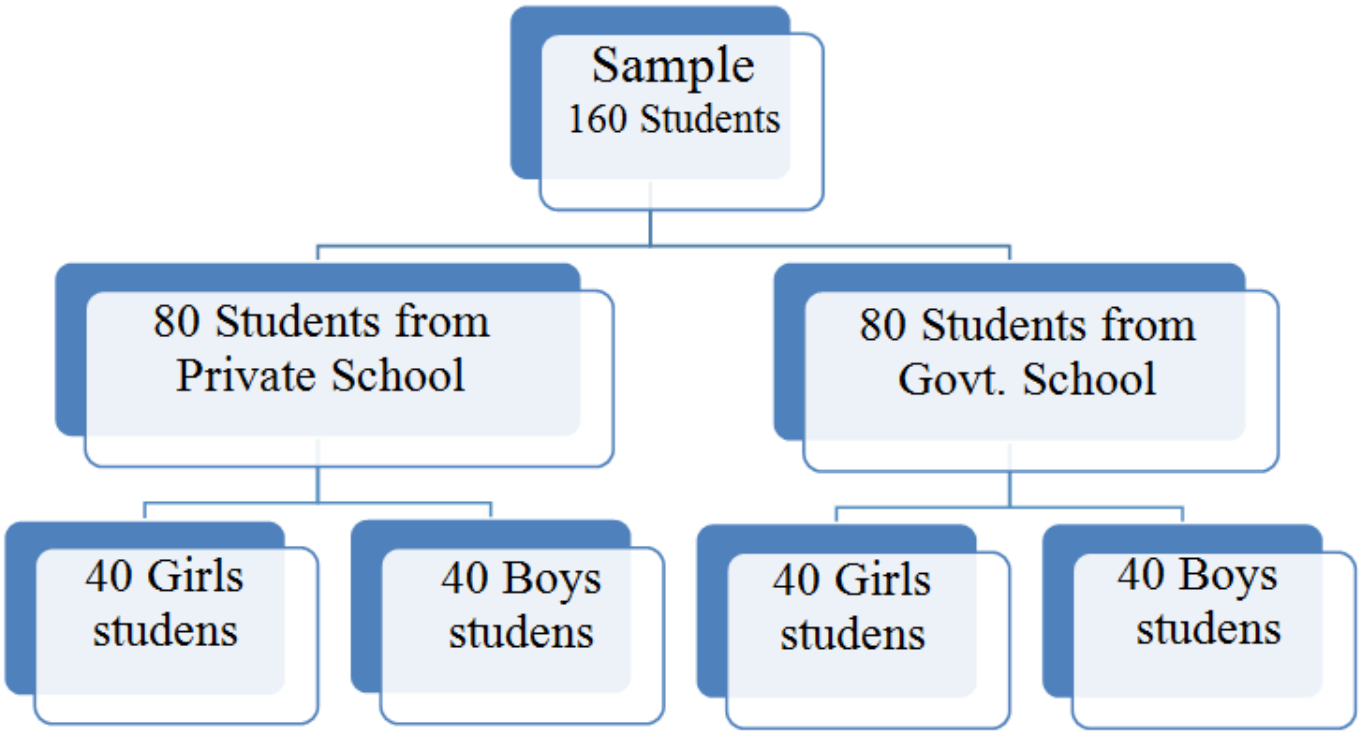
5.4. Reliability and Validity

The MPQ's internal consistency was assessed using Cronbach's alpha, yielding a reliability coefficient of **0.82**, indicating high reliability.

Content validity was ensured through expert review by three specialists in mathematics education.



5.5. Data Analysis

Data were analyzed using descriptive statistics (percentage, mean, standard deviation) and inferential statistics (t-test) at a 0.05 significance level.

5.6. Statistical Terms Used:

1. *Percentage (%):* Proportion of students in each phobia category.
2. *Mean (M):* Average phobia score for a group.
3. *Standard Deviation (SD):* Spread of scores around the mean.
4. *t-test:* Determines if the difference between two group means is statistically significant.

VI. Results And Interpretation

Objective 1: Levels of Mathematics Phobia among Elementary School Students.

Table 1

Phobia Level	Frequency (n)	Percentage (%)
Above Average	40	25.0
Average	80	50.0
Below Average	40	25.0

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Interpretation: Table 1 shows that 50% of the students have an average level of mathematics phobia, indicating that a majority experience moderate fear or anxiety toward mathematics. Further, 25% of the students fall in the above-average category, suggesting a considerable number of students suffer from high mathematics anxiety, which may affect their learning and performance. The remaining 25% show below-average phobia, reflecting a relatively positive attitude toward mathematics. Overall, the findings indicate that mathematics phobia is moderately prevalent among elementary school students.

Objective 2: Comparison of Mathematics phobia between male and female students.

Table 2

Gender	N	Mean (M)	SD	t	p
Boys	80	62.45	8.12	0.84	0.40
Girls	80	63.22	7.95		

Interpretation: Table 2 reveals that the mean mathematics phobia score of girls (M = 63.22) is slightly higher than that of boys (M = 62.45). However, the obtained t value (0.84) is not statistically significant ($p > 0.05$). This indicates that there is no significant difference in mathematics phobia between male and female students. Hence, gender does not appear to be a determining factor in mathematics phobia at the elementary level.

Objective 3: Comparison of Mathematics phobia between Government and Private schools students.

Table 3

School Type	N	Mean (M)	SD	t	p
Government	80	66.35	7.88	3.21	0.002
Private	80	60.14	7.35		

Interpretation: Table 3 shows that Government school students (M = 66.35) have significantly higher mathematics phobia than private school students (M = 60.14). The difference is statistically significant ($t = 3.21$, $p < 0.01$). This suggests that school type influences mathematics phobia, possibly due to differences in teaching methods, availability of resources, classroom environment, and teacher support.

- *Qualitative Findings*

Objective 4: Causes and Contributing Factors of Mathematics phobia Among Elementary School Students

Table 4

S.N.	Causes and Contributing Factors	foNo. stneduts	Yes	(%)
1	Lack of confidence in solving problems	160	54	33.8
2	Fear of making mistakes	160	48	30.0
3	Unengaging teaching methods	160	42	26.3
4	Negative experiences with teachers	160	38	23.8
5	Previous poor performance in mathematics	160	36	22.5

Interpretation: Table 4 indicates that the major causes of mathematics phobia include lack of confidence in problem-solving (33.8%) and fear of making mistakes (30.0%). Instructional factors such as unengaging teaching methods (26.3%) and negative experiences with teachers (23.8%) also contribute significantly. Additionally, previous poor performance in mathematics (22.5%) reinforces fear and anxiety. These findings show that mathematics phobia arises from both emotional and instructional factors.

VII. Discussion

The findings confirm that mathematics phobia is prevalent among elementary students, with half showing average levels and one-fourth displaying above-average phobia. This aligns with Kunwar's (2010) observation that negative classroom experiences and fear of failure contribute significantly.

No gender differences were detected, supporting Stoet and Geary's (2021) claim that general mathematics performance and attitudes are often similar across genders.

However, the significant difference between government and private school students suggests that resource availability, teacher training, and classroom environment may influence phobia levels.

Qualitative findings indicate that both emotional factors (fear, lack of confidence) and instructional factors (teaching methods, teacher–student relationships) contribute to mathematics phobia. These results emphasize the importance of supportive, engaging, and student-centered teaching strategies at the elementary level.

VIII. Conclusions

- Gender does not significantly affect phobia levels.
- Government school students exhibit higher phobia levels than private school students.
- Causes are both emotional and instructional, highlighting the need for teacher awareness and intervention.

IX. Recommendations

Teacher Training: Teachers should be trained in anxiety-reducing strategies, child psychology, and activity-based mathematics teaching.

Early Identification: Schools should identify symptoms of mathematics phobia at an early stage and provide timely academic and emotional support.

Positive Classroom Climate: Teachers should promote a non-threatening environment where mistakes are treated as learning opportunities.

Parental Awareness: Parents should be guided to encourage learning without excessive pressure or fear of failure.

Curriculum Enrichment: Mathematics curricula should incorporate real-life applications, games, and interactive activities to enhance engagement and reduce fear.

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