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A Survey Review Report on Mathematics Anxiety in Students in Current

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Abstract: ***Mathematics anxiety is a widespread issue affecting students' performance, confidence, and attitudes towards mathematics. This review paper explores the causes, impacts, and possible solutions to mathematics anxiety, highlighting factors such as teaching styles, early negative experiences, peer pressure, and societal stereotypes. By analyzing existing studies and doing survey on 100 respondents the paper aims to provide practical strategies to reduce anxiety and promote positive mathematical engagement among students.***

Keywords: Mathematics Anxiety, Student Performance, Teaching Methods, Peer Pressure, Confidence, STEM Education, Statistics Analysis.

1. Introduction & Literature Review

Mathematics anxiety has been described as experiencing feelings of panic and helplessness when asked to solve a mathematical task or problem (Tobias & Weissbrod, 1980). Mathematics anxiety seems to be particularly related to self-rating with regard to mathematics. People who think that they are bad at mathematics are more likely to be anxious. Most studies indicate a negative relationship between mathematics self-concept and mathematics anxiety (Hembree, 1990; Pajares and Miller, 1994; Jain and Dowson, 2009; Goetz et al., 2010; Hoffman, 2010). Unpleasant teaching and assessment strategies for students, like time testing (Ashcraft & Moore, 2009) and assigning mathematics as punishment (Oberlin, 1982), that are still widely in use in all school levels, may influence the spread of mathematics anxiety. Ashcraft and Kirk (2001) found that people with high Mathematics anxiety demonstrated smaller working memory spans than people with less Mathematics anxiety, especially in tasks that required calculation. In particular, they were much slower and made many more errors than others in tasks where they had to do mental addition at the same time as keeping numbers in memory. Mathematics anxiety is defined as fear, tension and discomfort which are felt by some individuals in situations involving mathematics, which may interfere with the performance of mathematical tasks. In academic settings, mathematics anxiety is a barrier to learning related subjects such as statistics, avoidance of optional mathematics courses within education, and the avoidance of math's and science, technology, engineering and math's related careers (Ashcraft MH.2002). If negative attitudes are not changed, students' performance, college and career choices will be limited (Shields, 2006). Mathematics anxiety is a reality for many students. Educators should be knowledgeable about its causes and provide supportive learning communities that assist students in overcoming it **(**Barnes, 2006).

Causes of Mathematics Anxiety:

1) **Early Negative Experiences:** Failures or harsh criticism in early mathematics learning can create fear and negative attitudes toward the subject (Hembree, 1990).
2) **Poor Teaching Methods:** Rote learning and focus on correct answers over understanding discourage creativity and confidence (Boaler, 2016).
3) **Fixed Mindset:** Believing mathematics ability is innate leads to fear of failure and reduced effort (Dweck, 2006).
4) **Gender Stereotypes:** Cultural beliefs that boys excel in mathematics increase anxiety among girls, affecting their confidence and STEM participation (Else-Quest et al., 2010).
5) **Lack of Real-World Relevance:** When mathematics feels abstract and disconnected from daily life, students lose interest and motivation **(**Boaler, 2016).
6) **Insufficient Individual Support:** A one-size-fits-all approach leaves struggling students behind, increasing anxiety **(**Maloney & Beilock, 2012).
7) **Peer Pressure & Classroom Environment:** Competitive settings and fear of judgment heighten stress and avoidance of mathematics (Foley et al., 2017).

Hence Mathematics anxiety is a result of various psychological, social, and educational factors. By understanding these causes, educators, parents, and policymakers can develop strategies to create a more supportive and engaging learning environment. Addressing these factors early can help students build confidence in their mathematical abilities and reduce anxiety over time.

2. Research Design

1) Statement of the Problem: Mathematics anxiety is the fear or nervousness that many students feel when they have to work on mathematics problems**.** This study will explore what causes Mathematics anxiety**,** how it affects students' performance**,** and what can be done to help reduce it.
2) Need and Importance of the Problem: Mathematics anxiety negatively affects students' academic success, mental health, and career choices. It is essential to understand its causes and impact to create supportive and engaging learning environments. Addressing

mathematics anxiety can help students build confidence, reduce stress, and improve overall performance.

3) **Objectives:** The study aims to measure the level of mathematics anxiety, explore its causes, and analyze its effect on learning and motivation. It also seeks to compare anxiety levels among different student groups and identify strategies and teaching methods to reduce math-related fear and improve learning outcomes.
4) **Scope of the study:** This study explores the causes and effects of mathematics anxiety and its impact on learning and motivation. By analyzing responses from 100 students and teachers, it identifies key factors like teaching methods and peer influence. It also suggests strategies and interventions to help reduce anxiety and improve mathematics learning.

3. Research Methodology

The research on "Mathematics Anxiety in Students' Lives" uses a mixed-methods approach, combining surveys and qualitative insights to study 100 students enrolled in mathematics courses. Data will be collected through structured questionnaires to analyze students' motivation, engagement, and attitudes. Statistical analysis will help identify key factors causing mathematics anxiety, its impact on performance, and suggest strategies, interventions, and curriculum improvements to reduce it.

Means of Data Pool:

1) **Essential (First Hand or Primary) Information:** A structured survey will be distributed to the 100 respondents, consisting of Likert-scale questions and multiple-choice items designed to gauge students' motivation, engagement, and performance in mathematics. This method allows for the collection of quantitative data that can be statistically analysed.
2) **Auxiliary (Secondary) Information:** In research on Mathematics Anxiety, secondary data will be gathered from various sources such as books, academic journals, online reports, and educational websites.

Questionnaire Technique

The questionnaire method is a structured way to collect data on attitudes, opinions, and behaviors through carefully designed questions. It combines closed-ended questions for measurable data and open-ended ones for deeper insights. Responses are collected online or on paper and analyzed using statistical and thematic methods. Though it may face response biases, it remains an efficient and cost-effective tool for research.

1) **Development of Survey:** Following advances are followed in building a poll:
   - Explaining the model and determining the factors to be estimated
   - Framing of a survey,
   - Form of a survey,
   - Question grouping,
   - Question plan and wording,
   - Pilot survey or Pre-testing,
   - Strategies for managing questionnaire.
2) **Forms of Analysis:**
   - **Descriptive Statistics:** Use frequency distribution, mean, median, mode, and percentage breakdown to summarize responses.
   - **Inferential Analysis:** Formulate hypotheses and apply tests like t-tests, chi-square, or ANOVA to draw conclusions from the data.
3) **Statistical Tool:**
   - **Percentage Analysis:** Percentage analysis calculates the proportion of responses in each category to show how opinions or characteristics are distributed.
   - **Pie Diagram:** A pie chart visually represents data as slices of a circle, with each slice showing a category's percentage of the total, making comparisons and trends easy to see.
   - **Chi-Square Test:** The chi-square test checks if there is a significant relationship between categorical variables by comparing observed and expected frequencies.

Chi-square Formula: $\chi^2 = \Sigma [(\text{Observed} - \text{Expected})^2 / \text{Expected}]$

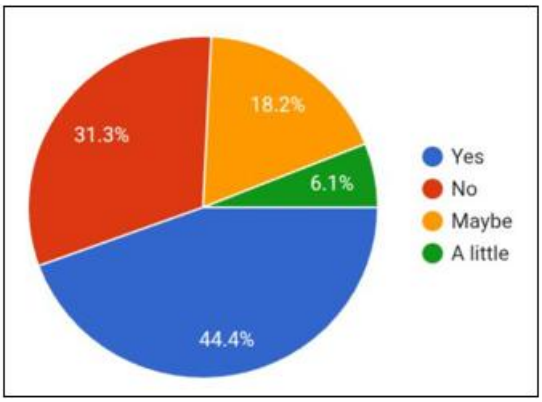
Assumptions of Chi-square Test:

1) Data are categorical
2) Observations are independent
3) Random sampling
4) **Sampling Techniques:**
   - **Probability Sampling:** Random selection where every member of the population has a known chance of being included.
   - **Non-Probability Sampling:** Non-random selection based on criteria like convenience or judgment.
5) **Tools:** Instruments like questionnaires, interviews, and observational checklists.
6) **Sample size:** 100 students of J. V. Jain College Saharanpur.
7) **Sampling Technique:** Stratified Random Sampling- to ensure representation across different age groups, skill levels, and backgrounds.
8) **Data Analysis:** List of survey questions:
   - What is your name?
   - What grade are you in?
   - Do you feel nervous during mathematics class?
   - What do you usually feel before mathematics exam?
   - Have you ever cried or panicked due to mathematics homework or test?
   - Has mathematics anxiety ever affected your career or course selection?
   - When you faced with a difficult mathematics problem,
   - what's your first reaction?
   - In your opinion what causes mathematics anxiety the most?
   - Does Mathematics anxiety impact your confidence in other subject?
   - How well do you manage your anxiety during mathematics exam?
   - How do you feel when you are asked to solve a mathematics problem in front of the class?
   - When you hear the word 'mathematics 'what is your first Reaction?
   - Do you avoid mathematics related tasks like calculation or problem solving when possible?
   - During a mathematics test how often do you feel so nervous that you can't concentrate?

- Do you believe that some people are just naturally bad at mathematics and can't improve much?
- Has Mathematics anxiety ever stop your from choosing a course or career path that involve mathematics?
- Do you feel more anxious in mathematics than in other subjects?
- Do you feel that your mathematics anxiety affect your overall academic performance?
- Do you think being good at mathematics is something you are born with or something you can develop?
- Have your previous mathematics experience (low marks, scalding, failure) made you afraid of mathematics?
- What do you think would help reduce your mathematics anxiety?

9) **Statistics Analysis:** To support the findings, four essential graphs from the survey are provided, reflecting the emotional and academic impact of mathematics anxiety. Survey table with their pie diagram:

a) Has mathematics anxiety ever affected your career or course selection?

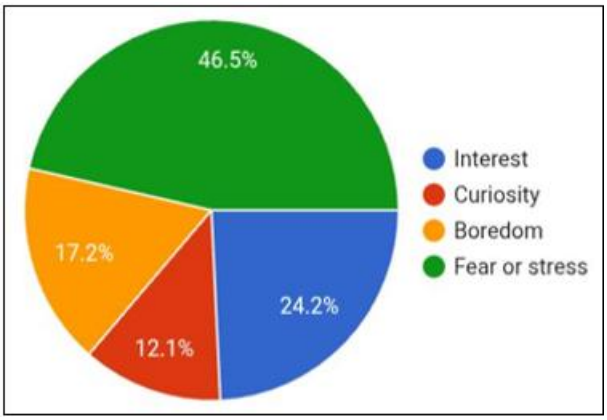


S. No.	Particulars	Output
1.	Yes	44
2.	No	31
3.	Maybe	18
4.	A little	6

Interpretation: In this graph, 44.4% of students said yes, mathematics anxiety has affected their career or course choices.18.2% responded maybe, 6.1% said a little, and 31.3% said no. This means that mathematics anxiety can play a major role in shaping students' future academic and career decisions.

Inference: A large portion of students have avoided or reconsidered academic/career paths due to mathematics anxiety, indicating a real impact on long-term decisions.

b) When you hear the word mathematics what is your first Reaction ?

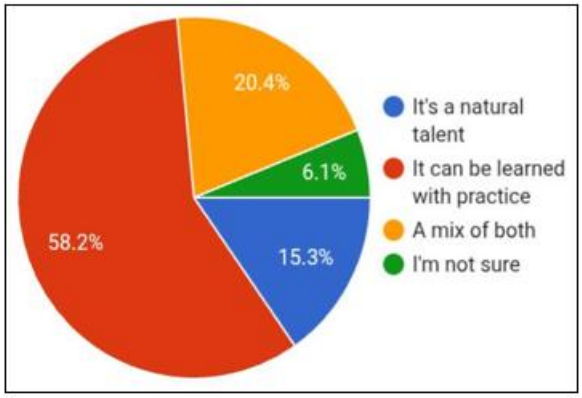


S. No.	Particulars	Output
1.	Interest	24
2.	Curiosity	12
3.	Boredom	17
4.	Fear & Stress	46

Interpretation: The results show that 46.5% of students feel fear or stress when they hear the word "Mathematics. " Only 24.2% said they feel interested, 17.2% feel bored, and 12.1% feel curious. This suggests that many students have a negative emotional reaction to math, which may affect their willingness to engage with it.

Inference: For nearly half the students, mathematics is emotionally associated with negative feelings, which could lead to
avoidance behavior and reduced engagement in learning.

c) Do you think being good at mathematics is something you are born with or something you can develop?



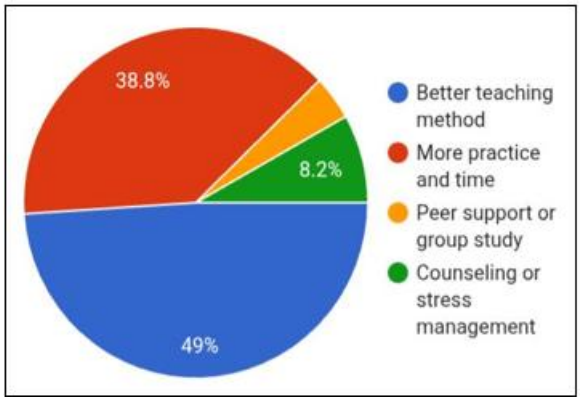
S. No.	Particulars	Output
1.	It's a natural talent	24
2.	It can be learned with practice	12
3.	A mix of both	17
4.	I'm not sure	46

Interpretation: Most students (58.2%) believe mathematics can be learned with practice. Only 15.3% think it's a natural talent, while 20.4% say it's a mix of both. A small group (6.1%) are unsure.

Inference: The majority of students have a growth mindset, believing mathematics skills can be developed through effort.

This positive belief can help reduce anxiety and improve learning outcomes.

d) What do you think would help reduce your mathematics anxiety?



S. No.	Particulars	Output
1.	Better teaching method	48
2.	More practice &time	38
3.	Peer support or group study	4
4.	Counseling or stress management	8

Interpretation: According to the graph, 49% of students think better teaching methods would reduce mathematics anxiety.38.8% prefer more practice and time, 8.2% suggest counseling, and only 4% choose peer support or group study.

Inference: Most students believe that improving teaching and getting more practice are the best ways to overcome mathematics anxiety. Fewer students rely on emotional or social support, showing that they see learning methods as more effective than counseling or group help.

e) **Hypothesis: H_0:** Mathematics anxiety has no significant impact on course/career decision.

H_1: Mathematics anxiety does have a significant impact.

Particulars	No. of Respondents	Percentage
Yes	53	53.5%
No	33	33.3%
Maybe	13	13.1%
Total	99	100 %

S. No.	O_i	E_i	$O_i - E_i$	$(O_i - E_i)^2$	$(O_i - E_i)^2 / E_i$
1	53	33	20	400	12.12
2	33	33	0	0	0
3	13	33	-20	400	12.12
Total	99	99			24.24

Calculated value =24.24, Degree of freedom = Number of catogries-1=3-1=2.

4. Result of Statistical Analysis

Since the calculated chi-square value (24.24) is greater than the critical value (5.99) at a 5% significance level with degree of freedom, we reject the null hypothesis. There is a statistically significant difference in how respondents answered the question. This means that mathematics anxiety does have a significant impact on individuals when choosing a course or career involving mathematics.

5. Findings of the Survey

1) Most students believe mathematics ability can be improved with regular practice and effective teaching.
2) Past negative experiences, especially failure and timed exams, are major causes of mathematics anxiety.
3) Emotional reactions like fear, panic, or avoidance are common, reflecting low confidence.
4) While many students try to solve problems independently, others seek help or quit due to anxiety.
5) Teacher behavior, peer pressure, and classroom environment also play key roles.
6) Mathematics anxiety often affects confidence in other subjects and long-term academic choices.
7) Though a few students report no effect, many feel impacted emotionally and academically.
8) Overall, mathematics anxiety is influenced by a mix of personal, academic, and social factors and needs both academic and emotional support in teaching.

6. Conclusion

The study highlights that mathematics anxiety significantly affects students' emotions, performance, and academic choices. Many students face stress, fear, or avoidance when dealing with math, often due to past failures, timed exams, teacher attitude, and peer pressure. This anxiety can even influence career decisions and impact confidence in other subjects. Emotional reactions like panic or crying during tests are common, showing that the issue is more emotional than intellectual. A supportive, low-pressure learning environment, combined with consistent practice and effective teaching, can help reduce mathematics anxiety and build students' confidence in mathematics.

References

[1] Ashcraft MH.2002 Mathematics anxiety: personal, educational, and cognitive consequences. Curr. Dir. Psychol. Sci.11, 181–185. (doi: 10.1111/1467-8721.00196)
[2] Ashcraft, M. H., & Faust, M. W. (1994). Mathematics anxiety and mental arithmetic performance: An exploratory investigation. Cognition & Emotion, 8 (2), 97–125. https: //doi. org/10.1080/02699939408408931
[3] Ashcraft, M. H., & Moore, A. M. (2009). Mathematics anxiety and the affective drop in performance. Journal of Psychoeducational Assessment, 27 (3), 197– 205. https: //doi. org/10.1177/0734282908330580
[4] Azizah, S. N., & Subhadra. (2020). Mathematics anxiety of senior high school students based on extrovert and introvert personality types. Journal of Physics Conference Series, 1521 (3).
[5] Azizah, S. N., & Subhadra. (2020). Mathematics anxiety of senior high school students based on extrovert and introvert personality types. Journal of Physics Conference Series, 1521 (3).
[6] Barnes, A. (2006). Investigating the causes of mathematics anxiety in the high school classroom. In L. P. McCoy (Ed.), Proceedings of Studies in Teaching 2006 Research Digest (pp.13-18). NC: Winston-Salem. Retrieved, September 1, 2009, from https: //bit. ly/3flwjX9

[7] Beilock, S. L., & Maloney, E. A. (2015). Mathematics Anxiety: A Factor in Mathematics Achievement Not to Be Ignored. Policy Insights from the Behavioral and Brain Sciences, 2 (1), 4-12.
[8] Boaler, J. (2016). Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages, and Innovative Teaching. John Wiley & Sons.
[9] Carey, E., Hill, F., Devine, A., & Szücs, D. (2016). The chicken or the egg? The direction of the relationship between mathematics anxiety and mathematics performance. Frontiers in Psychology, 6, 1987.
[10] Chinn, S. (2009) Mathematics anxiety in secondary students in England. Dyslexia, 15 (1), 61-68.
[11] Chipman, S. F., Krantz, D. H., & Silver, R. (1992). Mathematics anxiety and science careers among able college women. Psychological Science, 3, 292-295.
[12] Devine, A., Fawcett, K., Szűcs, D., & Dowker, A. (2012). Gender differences in mathematics anxiety and the relation to mathematics performance while controlling for test anxiety. Behavioral and Brain Functions, 8, 33
[13] Dowker, A. D. (2005). Individual Differences in Arithmetic: Implications for Psychology Neuroscience and Education. Hove: Psychology Press.
[14] Dweck, C. S. (2006). Mindset: The New Psychology of Success. Random House.
[15] Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-National Patterns of Gender Differences in Mathematics: A Meta-Analysis. Psychological Bulletin, 136 (1), 103127.
[16] Fan, X., Hambleton, R. K., & Zhang, M. (2019). Profiles of mathematics anxiety among 15-year-old students: A cross-cultural study using multi-group latent profile analysis. Frontiers in Psychology, 10, 1217. https: //doi. org/10.3389/fpsyg.2019.01217
[17] Foley, A. E., Herts, J. B., Borgonovi, F., Guerriero, S., Levine, S. C., & Beilock, S. L. (2017). The Mathematics Anxiety-Performance Link: A Global Phenomenon. Current Directions in Psychological Science, 26 (1), 52-58.
[18] Harris, M. (1997). Common Threads: Women, Mathematics and Work. London: Trentham Books.
[19] Hembree, R. (1990). The Nature, Effects, and Relief of Mathematics Anxiety. Journal for Research in Mathematics Education, 21 (1), 33-46.
[20] Hombres, R. (1990). The nature, effects, and relief of mathematics anxiety. Journal for Research in Mathematics Education, 21, 33-46.
[21] Luttenberger, S., Wimmer, S., & Paechter, M. (2018). Spotlight on mathematics anxiety. Psychology Research and Behavior Management, Volume 11, 311–322.
[22] Maloney, E. A., & Beilock, S. L. (2012). Mathematics Anxiety: Who Has It, Why It Develops, and How to Guard Against It. Trends in Cognitive Sciences, 16 (8), 404-406.
[23] Oberlin, L. (1982). How to teach children to hate mathematics. School Science and Mathematics, 82 (3), 261–261.
[24] Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2018). Mathematics Anxiety, Working Memory, and Mathematics Achievement in Early Elementary School. Journal of Cognition and Development, 19 (2), 165-181.
[25] Richardson, F. C., & Suinn, R. M. (1972). The Mathematics Anxiety Rating Scale: Psychometric Data. Journal of Counseling Psychology, 19 (6), 551-554.
[26] Shields, D. J. (2006). Causes of mathematics anxiety: The student perspective. Unpublished doctoral dissertation, Indiana University of Pennsylvania, Indiana.
[27] Soni, R., & Kumari, S. (2015). The Role of Parental Mathematics Anxiety and Mathematics Attitude in Their Children's Mathematics Achievement. International Journal of Research in Applied Sciences, 3 (4), 101-107.
[28] Tobias, S., & Weissbrod, C. (1980). Tobias, S., & Weissbrod, C. Anxiety and mathematics: An update. Harvard Educational Review, 50 (1), 63–70.
[29] Venkatesh Kumar, G., & Karimi, A (2010). Mathematics anxiety; mathematics performance and overall academic performance in high school students. Journal of the Indian Academy of Applied Psychology, 36 (1), 147-150.
[30] Young, C. B., Wu, S. S., & Menon, V. (2012). The Neurodevelopmental Basis of Mathematics Anxiety. Psychological Science, 23 (5), 492-501.