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UNPACKING MATHEMATICS ANXIETY AMONG STUDENTS: AN IN-DEPTH OVERVIEW

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Abstract

Mathematics or number anxiety, while a potent motivator, often operates as a hindrance in solving mathematical problems. This anxiety, poorly understood yet significant, typically exerts a negative influence, leading learners to adopt avoidance strategies. It can be viewed as a form of learned helplessness, where individuals perceive no escape from the distress of mathematics and endure both social and psychological discomfort until the ordeal concludes. This study seeks to elucidate the primary causes of math anxiety among students and delineate identifiable symptoms. Additionally, the study proposes preventive measures aimed at reducing math anxiety, thereby offering valuable insights for educators and learners alike.

Key words: Anxiety, Causes, Mathematics, Symptoms and Students.

Introduction

Mathematics, as an embodiment of human thought, reflects the active will, contemplative reason, and the pursuit of aesthetic perfection. Its fundamental components encompass logic and intuition, analysis and construction, generality and individuality (Richard Courant). Mathematics serves as a tool for honing an individual's mind, cultivating their reasoning abilities, and shaping their personality. Thus, it makes a substantial contribution to the fundamental education of people worldwide (Asiedu-Addo and Yidana, 2000). Fajemidagba, Salman & Ayinla (2012) have described Mathematics as a fundamental science subject and a cornerstone for the advancement of various science-based disciplines such as technology, astronomy, graphics, industry, and analytical reasoning in everyday life. Ayinla (2011) has also emphasized that mathematics serves as the foundation of all knowledge, underscoring its relevance across diverse disciplines. Onwuachu & Nwakonobi (2009) have noted that mathematics forms the core basis upon which the essence of human existence revolves and provides the platform for scientific and technological innovation.

Since the 1950s, mathematics anxiety has been recognized as a significant issue in educational settings. During that period, both Gough (1954) and Dreger & Aiken (1957) defined anxiety as a negative emotional response specifically related to mathematics, distinguishing it from general anxiety. Subsequently, extensive research has focused on mathematics anxiety. This attention is not only due to mathematics being an essential element of the school curriculum but also because it plays a vital role in daily life. Mathematics anxiety is described as a negative emotional reaction to mathematics (Ashcraft, 2000; Gresham, 2010; Maloney & Beilock, 2012; Richardson & Suinn, 1972). These negative emotions are often triggered by poor performance and difficulties in understanding mathematical concepts. Mathematics anxiety can affect individuals of all age groups, from

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11,S . Iss 11 A, 2022

elementary school students to adults (Alkan, 2013a & 2013b; Ashcraft, 1995; Cemen, 1987; Wu, Willcutt, Escovar & Menon, 2014).

Tobias and Weissbrod (1980) defined mathematics anxiety as "the panic, helplessness, paralysis, and mental disorganization that some people experience when faced with a mathematical problem." This condition is believed to impact a significant portion of the population. Tillfors (2003) described it as a learned emotional response characterized by frequent, severe, and intense anxiety. Mathematics anxiety, or phobia, can be defined as a feeling of tension that hinders an individual from effectively tackling mathematical problems. Many students develop a negative attitude towards mathematics, which influences their approach to problem-solving and can lead to the development of phobia and subsequent poor performance in the subject. Gierl and Bisanz (1995) view mathematics anxiety as a sense of tension and anxiety that interferes with one's ability to work with numbers and solve mathematical problems in a wide range of everyday and academic situations. Prolonged mathematics phobia has a detrimental impact on students' interest in the subject.

Review of Related Literature

Kumar and Karimi (2010) conducted a study examining the relationship between mathematics anxiety and students' mathematical performance. In this research, 424 school students participated and responded to a mathematics anxiety questionnaire. The study also delved into gender differences in mathematics anxiety. The results of their investigation revealed a negative correlation between mathematics anxiety and students' mathematical performance, and interestingly, this correlation affected both males and females equally (Kumar & Karimi, 2010).

Lyons and Beilock (2012) contributed to the understanding of anxiety's impact on math performance. They found that anxiety was linked to lower math grades and standardized test scores, but not all math-anxious individuals performed equally poorly in mathematical tasks. They highlighted that despite the importance of basic math skills in everyday life, many people experience anxiety when confronted with mathematical challenges in their daily routines. Furthermore, Lyons and Beilock (2012) discovered that highly math-anxious individuals exhibited significantly poorer math performance compared to non-mathematical tasks (Lyons & Beilock, 2012).

Aslan et al. (2013) conducted a study examining the influence of preschool teachers' mathematics anxiety and beliefs on children's mathematics achievement. Their findings indicated that teachers' mathematics anxiety did not have a significant impact on children's mathematical performance. However, the beliefs held by teachers about mathematics education played a significant role in influencing children's mathematics achievement. Notably, children whose teachers had strong belief scores demonstrated higher performance. The study suggested that efforts should be made to enhance teachers' beliefs about mathematics education during early childhood. Additionally, the study focused on preschool children, prompting a recommendation for further research to explore the effects of teachers' attitudes and anxiety on the mathematics achievement of older students.

Buckley (2013) highlighted the misconception that only highly intelligent students are capable of developing advanced mathematical skills. The researcher pointed out that anxiety

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11,S . Iss 11 A, 2022

can lead to a decline in math performance during exams by limiting the cognitive resources individuals can access to solve mathematical problems. Furthermore, Buckley (2013) emphasized that due to anxiety, students often develop a negative attitude towards mathematics, leading them to avoid subjects, courses, and careers that involve math. This avoidance behavior can restrict their opportunities and career paths.

Boruah and Saikia (2014) conducted a study on mathematics phobia among degree students in Jorhat and Golaghat District of Assam. The study aimed to identify the root causes of mathematics phobia among students. It highlighted factors such as the lack of an adequate number of mathematics books in college libraries and insufficient practical classroom facilities as contributors to mathematics phobia.

Kaur (2017) conducted research on math phobia, revealing its existence among students characterized by anxiety during math class and difficulty understanding math problems, among other symptoms. The study identified causes such as poor student-teacher relationships and non-conducive classroom environments for math instruction. It emphasized the need for concerted efforts by all stakeholders to address this issue and improve students' mathematics achievement.

Mollah (2017) explored mathematics anxiety among school students, describing its causes, impacts on students, and strategies for mitigation. Mathematics anxiety was depicted as manifesting in psychological, physical, and behavioral expressions, with negative effects on students' performance, achievement, and social development. The study identified various reasons for the development of mathematics anxiety, including negative teacher attitudes, ineffective teaching methods, and high-stakes test pressure. The study emphasized the importance of addressing mathematics anxiety comprehensively within the education system, with teachers playing a key role in adopting effective teaching methods.

Vesile, A. (2018) conducted a systematic review focusing on studies related to "mathematics anxiety" in Turkey. This review analyzed 59 papers and identified that most studies were conducted with middle school students and primarily employed quantitative approaches. The review indicated that mathematics anxiety resulted from factors such as students' achievement, self-efficacy, fear, and a lack of support from parents and teachers in mathematics education.

Agouti et al. (2018) examined the effect of math anxiety on students' performance in intermediate and secondary classes. Their findings demonstrated a strong negative correlation between anxiety and overall mathematical performance among students in intermediate and secondary levels, excluding grade twelve.

Zhang et al. (2019) conducted a meta-analytic investigation into the relationship between math anxiety and math performance. The results revealed a robust negative association between math anxiety and performance. This negative connection was more pronounced in studies involving Asian students, senior secondary school levels, and those assessing problem-solving skills. Conversely, the correlation was weaker in studies involving European students and elementary levels. The study shed light on the diverse factors influencing the link between math anxiety and math performance across different contexts.

Causes of Math Anxiety

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11,S . Iss 11 A, 2022

Math anxiety, or math phobia, can be triggered by various factors. These factors can vary from person to person, and sometimes they may overlap. Here are some common causes of math anxiety:

Negative Past Experiences: Previous difficulties or failures in math can lead to a fear of math. A student who has struggled with math concepts in the past may develop anxiety when faced with new math challenges.

Lack of Confidence: Low self-confidence in one's math abilities can contribute to math anxiety. Believing that you are not good at math can create a self-fulfilling prophecy, making it even more challenging to perform well in math.

Pressure to Perform: High-stakes exams, standardized tests, and competitive academic environments can put immense pressure on students. The fear of failing or not meeting expectations can lead to anxiety.

Poor Teaching Methods: Ineffective teaching methods, inadequate explanations, or rushed instruction can leave students feeling lost and confused. This can result in math anxiety as students struggle to understand the material.

Fear of Judgement: The fear of being judged by teachers, peers, or parents can be a significant factor in math anxiety. Students may worry about making mistakes in front of others or being seen as incapable.

Parental or Peer Influence: Negative attitudes toward math from parents, siblings, or peers can be internalized by students, affecting their own attitudes and confidence in math.

Perceived Irrelevance: Some students may view math as irrelevant to their future goals and interests. This perception can diminish their motivation to engage with math and increase math anxiety.

Time Pressure: Feeling rushed or having limited time to complete math assignments or tests can increase anxiety levels. Students may fear not finishing in time or making careless errors due to time constraints.

Lack of Understanding: Difficulty in grasping fundamental math concepts can create anxiety. When students struggle to understand basic principles, they may find subsequent math topics even more challenging.

Cognitive Factors: Some individuals may have cognitive factors that make it more challenging for them to process mathematical information. These cognitive differences can contribute to math anxiety.

Cultural or Gender Stereotypes: Stereotypes related to gender or cultural backgrounds can lead to feelings of inadequacy and anxiety in math. Some students may believe they are not supposed to excel in math due to these stereotypes.

Emotional Factors: Personal stress, anxiety disorders, or other emotional issues can exacerbate math anxiety. General anxiety can spill over into math-related tasks, making them even more daunting.

Fear of Failure: The fear of failing in math, and the consequences associated with it, can be a significant source of anxiety. Students may worry about their academic future or how their grades will impact their self-worth.

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11,S . Iss 11 A, 2022

It's important to note that math anxiety is a real and valid concern for many individuals. Recognizing the causes of math anxiety is the first step in addressing and managing it. Supportive teaching methods, personalized learning approaches, and building self-confidence can help individuals overcome math anxiety and develop a more positive attitude towards mathematics.

Symptoms of Math Anxiety

- **Unusual nervousness when doing or thinking about math**: Even thinking about the subject of math is enough to cause stress to the student.
- **Passive behaviour**: The student is either too afraid of failure or simply thinking about math brings so many negative emotions, that he or she is unwilling to even try.
- **Feeling of being alone:** The student feels that he or she is the only one incapable of finding the solutions, even if the math is extremely complicated.
- **Feeling of permanency**: The student begins to believe that he or she is naturally bad at math and always will be, so he or she gives up trying to improve.
- **Lack of confidence:** The student expects never to know the answers to math questions, so the student depends on other people to do math for him or her. Example: expecting his or her parents to help with homework.
- **Panic during tests or when called on to answer questions**: The classroom becomes a major source of stress for the student, especially when he or she is taking a test or expected to contribute in class.

Preventive Measures

Math anxiety can be a challenging issue to overcome, but there are several remedial measures and strategies that can help individuals manage and reduce their math anxiety. Here are some effective approaches to address math anxiety:

Build Confidence:

- Focus on your strengths and acknowledge past math successes, no matter how small.
- Challenge negative self-talk and replace it with positive affirmations about your math abilities.
- Start with easier math problems and gradually work your way up to more challenging ones to boost your confidence.

Identify and Address Specific Concerns:

- Identify the specific math topics or concepts that cause anxiety, and seek targeted help or resources for those areas.
- Seek extra practice or tutoring for challenging topics to improve your understanding and skills.

Use Visualization Techniques:

- Visualize yourself solving math problems successfully. This positive mental imagery can help reduce anxiety and boost confidence.

Set Realistic Goals:

- Set achievable, short-term goals for your math studies. Celebrate your accomplishments, no matter how small, to build motivation and confidence.

Develop Effective Study Habits:

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11,S . Iss 11 A, 2022

- Create a dedicated study environment that is free from distractions.
- Break down math problems into smaller, manageable steps to make them less overwhelming.
- Practice regularly and consistently to reinforce your math skills.

Seek Support and Guidance:

- Reach out to teachers, professors, tutors, or classmates for help and clarification when needed.
- Join study groups or math clubs to gain peer support and share strategies for overcoming math anxiety.

Use Technology and Online Resources:

- Utilize educational websites, apps, and online tutorials that offer interactive math lessons and practice problems.
- Online resources can provide additional explanations and alternative approaches to math concepts.

Relaxation Techniques:

- Practice relaxation techniques such as deep breathing, mindfulness, or meditation to manage anxiety before and during math-related tasks.
- Progressive muscle relaxation can also help reduce physical tension associated with math anxiety.

Positive Study Habits:

- Develop a study routine and schedule that includes breaks and rewards for your efforts.
- Create a positive association with math by incorporating enjoyable activities or rewards into your study sessions.

Gradual Exposure:

- Gradually expose yourself to more challenging math problems or situations. Start with easier tasks and work your way up to more complex ones as your confidence grows.

Understand Mistakes:

- Embrace mistakes as opportunities for learning and improvement rather than sources of failure or anxiety.
- Analyze your errors to understand where you went wrong and how to avoid similar mistakes in the future.

Professional Help:

- If math anxiety is significantly impacting your daily life or academic progress, consider seeking professional help from a therapist or counselor who specializes in anxiety or educational issues.
- Cognitive-behavioral therapy (CBT) can be effective in addressing math anxiety.

Remember that overcoming math anxiety is a gradual process, and it may take time and effort. Be patient with yourself and stay persistent in your efforts to improve your math skills and reduce anxiety. With the right strategies and support, it is possible to build confidence and develop a more positive attitude towards mathematics.

Conclusion

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11,S . Iss 11 A, 2022

In conclusion, addressing math anxiety in students is a multifaceted task that involves various stakeholders in the educational system. To prevent and alleviate math anxiety, several strategies and initiatives can be implemented:

- **Continuous Teacher Training:** Math teachers should undergo periodic re-training to stay updated on innovative teaching methods and approaches. This ensures that they can adapt their teaching techniques to better cater to the needs of anxious students.
- **Counselling Services:** Secondary schools should establish counselling units to provide support and guidance to students who are struggling with math anxiety. These units can help students understand the importance and real-world applications of mathematics in their daily lives.
- **Balanced Curriculum:** Avoid overloading the mathematics curriculum at the secondary school level. A balanced and manageable curriculum can reduce the pressure and fear associated with mathematics learning.
- **Strong Teacher-Student Relationships:** Cultivate positive teacher-student relationships to create a supportive learning environment where students feel comfortable discussing their difficulties and seeking help.'
- **Real-World Relevance:** Connect math lessons to students' daily lives and emphasize the practical applications of mathematics, making learning more engaging and relatable.
- **Practical Approaches:** Encourage students to experiment, explore, and understand mathematical concepts through hands-on experiences and problem-solving.
- **Specialized Teacher Training:** Provide specialized training to math teachers, ensuring they have the proficiency and extensive knowledge required to teach mathematics effectively.
- **Math Labs and Practical Classes:** Establish math labs and incorporate practical classes to facilitate interactive and experiential learning.
- **Math Clubs and Competitions:** Promote mathematics through math clubs, quizzes, competitions, and Math Olympiads, highlighting the significance and excitement of mathematics.
- **Encourage Questions:** Create a classroom environment where students are encouraged to ask questions without fear of judgment, as asking questions is a sign of strength and curiosity.

In future research, it is essential to delve further into the effects of math test anxiety at different educational levels and pinpoint specific math topics or chapters that tend to trigger anxiety in students. Additionally, educators should adopt student-centered approaches to support and enhance the learning and performance of highly anxious students. By implementing these measures, we can work collectively to reduce math anxiety, enabling students to embrace mathematics with confidence and enthusiasm.

References

1. Agouti, M. F., Shehayeb, S. & Mchiek, M. (2018). The Effect of Math Anxiety on Students' Performance in the Intermediate and Secondary Classes. *International Journal of Science and Research, 8*(9), 739-745.

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11,S . Iss 11 A, 2022

2. Alkan, V. (2013a). Reducing mathematics anxiety: The ways implemented by teachers at primary schools in Turkey. *International J. Soc. Sci. & Education, 3* (3), 795-807.

3. Alkan, V. (2013b). Mothers and their relation with pupils' mathematics anxiety. International Global Research Analysis, 2(4): 83-86.

4. Ashcraft, M.H. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science, 11*(5), 181-185. http://dx.doi.org/10.1111/1467- 8721.00196

5. Aseidu-Addo, S. K. and Yidana, I. (2000). "Mathematics Teachers Knowledge of the subject Content and the Methodology". *Journal of the Mathematical Association of Ghana, 4*(12), 45-51.

6. Aslan, D., Oğul, I. G. & Taş, I. (2013). The Impacts of Preschool Teachers' Mathematics Anxiety and Beliefs on Children's Mathematics Achievement. *International Journal of Humanities and Social Science Invention 2*(7), 45-49.

7. Boruah, S. & Saikia, J. (2014). Mathematics Phobia among the Degree Students of Jorhat and Golaghat District of Assam: A Study. *International Journal of Science and Research, 3*(4), 232-234.

8. Cemen, P. B. (1987). *The nature of mathematics anxiety.* (Report No. SE 048 689). Stillwater: Oklahoma State University. (ERIC Document Reproduction Service No. ED 287 729).

9. Dreger, R., & Aiken, L. (1957). The identification of number anxiety in a college population. *Journal of Educational Psychology, 48*(6), 344-351.

10. Fajemidagba, M., Salman, M. & Ayinla, L. (2012). Effect of teachers' instructional strategy pattern on senior school students' Performance in Mathematics word problem in Ondo, Nigeria. *Journal of Education and Practice, 3*(7), 159-168.

11. Finlayson, M. (2014). Addressing math anxiety in the classroom. *Improving Schools, 17*(1), 99-115.

12. Gierl, M. J. & Bisanz, J. (1995). Anxiety and attitude related to Mathematics in grade 3 and 6. *The Journal of Experimental Education 63*(2), 139-158.
13. Gough, M. F. (1954). Mathemaphobia: Causes and treatments. *Clearing House, 28,* 290-294. Retrieved from http://www.jstor.org/stable/30176259

ISSN PRINT 2319 1775 Online 2320 7876

 UGC CARE Listed (Group -I) Journal Volume 11,S . Iss 11 A, 2022

14. Gresham, G. (2010). A study exploring exceptional education pre-service teachers' mathematics anxiety. *Issues in the Undergraduate Mathematics Preparation of School Teachers, 4*, 1-14. Retrieved from http://www.k-12prep.math.ttu.edu/

15. Kaur, G. (2017). Math-Phobia: Causes and Remedies. *International Journal for Research in Applied Science & Engineering Technology, 5*(VI), 1248.

16. 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*, 147-150.

17. Lyons, I., & Bei lock, S. (2012). *Mathematics Anxiety: Separating the math from the Anxiety.* Retrieved from (Research study, University of Chicago, Department of Psychology: http://www.edweek.org/media/mathanxiety.pdf.

18. Maloney, E., & Block, S. (2012). Math anxiety: who has it, why it develops, and how to guard against it. *Trends in Cognitive Science, 16*(8), 404-406.

19. Mollah, K. (2017). Mathematics Anxiety among the School Students. *Pramana Research Journal, 7*(11), 122-127.

20. Richardson, F.C., & Suinn, R.M. (1972). The mathematics anxiety rating scale: Psychometric data. *Journal of Counselling Psychology, 19,* 551-554. http://dx.doi.org/10.1037/ h0033456

21. Tobias, S. & Weissbrod, C. (1980). Anxiety and Mathematics: an update. Harvard *Educational Review, 50*(1), 63-70.

22. Tillfors, M. (2003). Why do some individuals develop social phobia? A review with emphasis on the neurobiological influences. *Nord Journal of Psychiatry (Taylor & Francis) 58*(4), 267-276.

23. Wu, S.S., Willcutt, E.G., Escovar, E., & Menon, V. (2014). Mathematics achievement and anxiety and their relation to internalizing and externalizing behaviors. *Journal of Learning Disabilities, 47*(6), 503-514.

24. Zhang, J., Zhao, N., & Kong, Q. P. (2019). The Relationship Between Math Anxiety and Math Performance: A Meta-Analytic Investigation. *Front. Psychol.*, https://doi.org/10.3389/fpsyg.2019.01613

25. Vesile, A. (2018). A Systematic Review Research: 'Mathematics Anxiety' in Turkey. *International Journal of Assessment Tools in Education, 5*(3), 567-592.