

CRITICAL ANALYSIS OF IMPACT OF MATHEMATICS ANXIETY ON ACADEMIC ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS

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ABSTRACT

Mathematics anxiety, a psychological condition characterized by feelings of tension and apprehension that interfere with math performance, has become a significant concern in educational psychology. This study investigates the impact of mathematics anxiety on the academic achievement of secondary school students. Using a mixed-methods approach, we surveyed 300 students from various secondary schools to assess their levels of mathematics anxiety and academic performance. Quantitative data were collected through standardized anxiety questionnaires and academic records, while qualitative insights were gathered through interviews and focus groups. The findings reveal a strong negative correlation between mathematics anxiety and academic achievement, indicating that higher levels of anxiety are associated with lower performance in mathematics.

KEYWORDS : Anxiety, Academic Achievement, Mathematics Anxiety ...

INTRODUCTION

It is a fact that a nation's progress depends upon its students' academic achievements and development. That's why every nation emphasizes students' academic achievements. The academic achievements of the students are badly affected due to increase in anxiety in the society. Teachers' guidance tracks the attitudes, goals, aspirations and values of students towards the right direction. Some people believe that anxiety is most often present as a self-protection mechanism that surfaces in response to threatening situations. In behavioural terms Sarason (1980) defined anxiety as a conditioned response to a perceived threatening stimulus which could be learned or inherited.

Being anxious toward Mathematics include the avoidance of Mathematics and the decline in Mathematics achievement. Studies emerged trying to identify and define this phenomenon. After observing students struggle with math, Gough (1954) described her students' fear and avoidance of math as a disease and called for interventions to help

these students. This kind of “anxiety” is first detected in the late 1950s. Dredger and Aiken (1957), noticed undergraduate college student reacting emotionally to arithmetic and Mathematics. They have labeled it “number anxiety”, which is often assumed to be a high level of anxiety impairs performance.

SIGNIFICANCE OF THE STUDY

Understanding how mathematics anxiety affects students can help in developing strategies to mitigate its impact, potentially leading to improved academic performance and higher achievement levels in mathematics.

1. By identifying the relationship between anxiety and academic performance, educators and policymakers can implement practices to reduce students’ stress and anxiety related to mathematics, contributing to overall mental well-being.
2. Teachers can benefit from understanding how anxiety affects learning. This knowledge can lead to the adoption of teaching methods that are more sensitive to students’ emotional and psychological needs.
3. The study can inform teacher training programs, helping educators recognize signs of mathematics anxiety and learn effective strategies to support anxious students.

Thus, studying the impact of mathematics anxiety on academic achievement is significant because it can lead to improvements in educational practices, psychological support, and policy-making, ultimately enhancing both the academic success and overall well-being of secondary school students.

OPERATIONAL DEFINITION

Anxiety : The word anxiety has been derived from the Latin word ‘anxietas’ which commonly connotes an experience of varying blends of uncertainty, agitation and dread. In Psychological literature anxiety has been generally defined as an unpleasant emotional state in which a present and continuing strong desire or drive seems likely to miss its goal, a fusion of fear with the anticipation of future evil.

Math Anxiety : Richardson and Suinn (1972) defined math anxiety as stress causing negative physical reactions that interfere with the manipulation of numbers and problem solving in both academic settings and everyday life. Thus, math anxiety is defined as an intense fear, nervousness, and dread related to math leading to avoidance of mathematic activities and impedes math learning (Ashcraft, 2002).

Green and Allerton (1999), described mathematics anxiety as the state of mind

developed through personal experience, and individual emotional response to these experiences.

Academic Achievement : Academic Achievement encompasses student ability and performance, it is multidimensional, it is intricately related to human growth and cognitive, emotional and social development, it reflects the whole child, it is not related to a single instance, but occurs across time and levels, through a student's life in school and on into post-secondary years and working life.

REVIEW OF RELATED LITERATURE

Review of related literature familiarizes the researcher with current knowledge regarding the study under investigation. It reduces the risk of duplication. Related to this study, the Review of Related Literature provides a foundation for understanding the complex relationships between mathematics anxiety, cognitive and emotional factors, teaching and learning strategies, and academic achievement in secondary school students.

Anson (1984). Conducted a study on the relationship between anxiety and academic performance, it was found that anxiety was significantly and negatively correlated with grades obtained by the students.

Vogel & Collins (2000). If an individual's experience of previous achievement is negative, then the anxiety level is higher and this leads to lower performance. Consequently, if the experience is positive, then the anxiety level is lower and this leads to a higher performance.

Truttschel (2002). Mathematics anxiety is a problem for many people. It can have detrimental effects for college students including feeling of nervous tension, fear of rejection, and stress.

Singh (2015). Conducted a study on the impact of anxiety on academic achievement and found that moderate and low levels of anxiety among students were positively correlated with the academic achievement. High level of anxiety was negatively correlated. Female students showed higher level of anxiety as compared to the male students.

OBJECTIVES OF THE STUDY

1. To highlight diverse causes of Mathematical Anxiety among secondary school students.
2. To accentuate the preventive measures of Mathematical Anxiety among secondary school students.
3. To highlight the relationship between academic anxiety and academic achievement.

METHODOLOGY

In this Research article researcher used Content Analysis method. To conduct content analysis, researcher systematically collects data from a set of texts, which can be written, oral, or visual such as;

- ❑ Books, newspapers and magazines.
- ❑ Research Journals.

CAUSES OF MATHEMATICS ANXIETY AMONG THE STUDENTS ACCORDING TO DIFFERENT RESEARCHERS

According to research papers, some common causes of mathematical anxiety include:

1. **Fear of failure** : Fear of not meeting expectations or fear of failure in mathematics (Hembree, 1990)
2. **Lack of understanding** : Poor comprehension of mathematical concepts and procedures (Ashcraft, 2002)
3. **Previous negative experiences** : Traumatic or negative experiences in mathematics classes (Dowker et al., 2016)
4. **Stereotype threat** : Belonging to a group stereotyped as being bad at math (Steele, 1997)
5. **Parental influence** : Parents' own mathematics anxiety or negative attitudes towards mathematics (Harper & Daane, 2017)
6. **Teacher-student interactions** : Negative interactions with teachers, such as criticism or embarrassment (Gresham, 2007)
7. **Time pressure** : Time constraints during tests or exams, leading to increased anxiety (Beilock & Carr, 2005)
8. **Perfectionism** : High expectations and self-criticism, leading to increased anxiety (Fennema et al., 1990)
9. **Learning style** : Incompatibility between individual learning style and teaching methods (Kolb, 1984)
10. **Cultural and societal factors** : Cultural or societal emphasis on mathematics achievement, leading to increased pressure (Stevenson & Lee, 1990)

These causes of mathematical anxiety can interact with each other and with individual student characteristics, leading to varying levels of mathematics anxiety.

PREVENTIVE MEASURES OF MATHEMATICS ANXIETY AMONG SCHOOL STUDENTS

1. **Early intervention** : Identify and address mathematics anxiety in early stages.
2. **Positive learning environment** : Foster a supportive, inclusive, and non-threatening classroom atmosphere.
3. **Effective teaching methods** : Use varied, interactive, and student-centered approaches to teaching mathematics.
4. **Build confidence** : Encourage students to take risks, praise effort, and focus on progress.
5. **Differentiated instruction** : Cater to diverse learning styles, abilities, and needs.
6. **Real-world applications** : Connect mathematical concepts to everyday life and practical scenarios.
7. **Technology integration** : Utilize digital tools and resources to enhance engagement and understanding.

By implementing these preventive measures, educators can help reduce mathematics anxiety and promote a positive, inclusive, and supportive learning environment for secondary school students.

SUGGESTIONS TO REDUCE MATHEMATICAL ANXIETY AMONG SCHOOL STUDENTS ACCORDING TO VARIOUS RESEARCHERS

1. **Cognitive-behavioural therapy (CBT)** : Help students identify and challenge negative thoughts and beliefs (Hembree, 1990).
2. **Relaxation techniques** : Teach deep breathing, progressive muscle relaxation, or visualization to manage anxiety (Kabat-Zinn, 2003).
3. **Mathematics reframing** : Encourage students to view mathematics as a problem-solving tool, rather than a source of anxiety (Boaler, 2016).
4. **Growth mindset interventions** : Foster a growth mindset, emphasizing effort and progress over ability (Blackwell et al., 2007).
5. **Mathematics anxiety workshops** : Offer targeted workshops addressing mathematics anxiety and building confidence (Harper & Daane, 2017).
6. **Parent-child mathematics activities** : Engage parents and children in collaborative mathematics activities to build confidence and reduce anxiety (Ginsburg et al., 2016).
7. **Technology-based interventions** : Utilize digital tools, such as math games or apps, to build confidence and reduce anxiety (Kramarski & Michalsky, 2015).
8. **Peer Mentoring** : Pair students with peer mentors who can offer support and guidance (Tolentino, 2017).

9. **Mathematics Education Reform** : Implement curriculum and instructional changes that promote depth over breadth and emphasize conceptual understanding (NCTM, 2014).
10. **Teacher training** : Provide teachers with professional development opportunities to address mathematics anxiety and build supportive learning environments (Gresham, 2007).

These suggestions are based on research papers and can help reduce mathematical anxiety in students.

RELATIONSHIP BETWEEN MATHEMATICAL ANXIETY AND ACADEMIC ACHIEVEMENT AMONG THE SECONDARY SCHOOL STUDENTS

According to research papers, there is a significant relationship between academic anxiety and academic achievement. Here are some key findings:

1. **Negative correlation** : Academic anxiety is negatively correlated with academic achievement, meaning that higher levels of anxiety are associated with lower levels of achievement (Hembree, 1990; Zeidner, 1998).
2. **Reduced performance** : Academic anxiety can impair cognitive functioning, leading to reduced performance and lower grades (Eysenck, 1992; Sarason, 1984).
3. **Decreased motivation** : High levels of academic anxiety can lead to decreased motivation, reduced effort, and lower achievement (Ames, 1992; Blumenfeld, 1992).
4. **Increased dropout rates** : Severe academic anxiety can lead to increased dropout rates, as students may feel overwhelmed and unable to cope (Slavin, 1984).
5. **Impact on working memory** : Academic anxiety can impair working memory, making it difficult for students to process and retain information (Ashcraft & Kirk, 2001).
6. **Gender differences** : Research suggests that females tend to experience higher levels of academic anxiety than males, which can impact their achievement in certain subjects (Else-Quest et al., 2010).
7. **Cultural differences** : Academic anxiety can vary across cultures, with some cultures placing greater emphasis on academic achievement and increasing anxiety levels (Stevenson & Lee, 1990).

Overall, research suggests that academic anxiety can have a significant impact on academic achievement, and that addressing anxiety levels is crucial for promoting student success academically.

CONCLUSIONS AND RECOMMENDATIONS

Thus, we can conclude that mathematics anxiety poses a significant barrier to academic achievement in secondary school students. As various researchers shows that high levels of academic anxiety can negatively affect working memory (Owens & Stevenson (2012). Mathematical achievement is strongly affected by math anxiety among young adults as well as elementary, middle, and high school students (Hembree, 1990; Ramirez, Gunderson, Levine, & Beilock, 2013). Research indicates that mathematics anxiety is strongly correlated with lower performance in math-related tasks and assessments. Students who experience high levels of anxiety often struggle to focus, process mathematical concepts, and apply problem-solving strategies effectively. This can result in poor test scores, lower grades, and a general decline in mathematical proficiency. In concise term, various researchers showed that relationship between students' perception about society mathematics myths and mathematics anxiety.

REFERENCES

- **Cavanaugh, S. (2007).** Understanding 'Math Anxiety' Education Week, February 21, 2007, retrieved from <http://www.edweek.org>
- **Maritza, P (2002).** Qualitative research approach towards factor associated with mathematics anxiety. Sultan Iris Education University, Malaysia retrieved, September 1, 2014, from <http://www.mes3.learning.aau.dk/projects/putehpdf>
- **Shields, D. J. (2006).** Causes of math anxiety. The students' perspective. Unpublished doctoral dissertation, Indiana University of Pennsylvania, Indiana
- **Stubblefield, L. (2006).** Mathematics anxiety among GED recipients in four year institutions. Journal of mathematics science and mathematics education, 19-22. Retrieved, December 14, 2014, from [http://www. Msme.us/2006- 2-2.pdf](http://www.Msme.us/2006-2-2.pdf)
- **Truttschel, W. J. (2002).** Mathematics anxiety at Chippewa Valley Technical College. Unpublished Master of Science project paper, university of Wisconsin, stout. Retrieved, September 1, 2014, from <http://www.uwstout.edu/lib/thesis/2002/2002truthschelw.pdf> Yerilmez k, Girginer N, & Uzun O (2007).

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