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Students' Self-perception on their Mathematics Anxiety

Krishna Chandra Paudel
Department of Mathematics Education
Mahendra Ratna Campus, Tribhuvan University, Nepal
kcpaudel@trinitycollege.edu.np
https://orcid.org/0000-0003-3381-0248
Shree Prasad Ghimire
Department of Mathematics Education
Mahendra Ratna Campus, Tribhuvan University, Nepal
shreeprasad.ghimire@mrc.tu.edu.np
https://orcid.org/0009-0002-9697-2949

Abstract
Mathematics anxiety greatly affects students' academic success and psychological well-being. This study explores math anxiety among 150 high school students in Kathmandu by investigating its prevalence, its sources, and potential methods for improving it. The research examined students' perceptions of their mathematical anxiety across various educational stages using a combination of quantitative surveys and semi-structured interviews. The findings indicated that 60% of students recognized experiencing mathematical anxiety related to a figure that increased to 86.67% after an educational intervention. The study discovered that the majority of students experience math anxiety during high school (48%) time, and they hold different perspectives on ways to reduce it. It was found that 68% of students expressed the ability to manage anxiety on their own and understand that anxiety is temporary. The study emphasizes the significance of providing personalized psychological guidance and individualized intervention strategies to support students' mathematical learning experiences and overall well-being.

Key Words: *Anxiety Mitigation*, *Experience of Math Anxiety, Reduction of Math anxiety, Students' Self-perception,*

Introduction

Mathematics anxiety is a major obstacle in educational environments, especially influencing the academic achievement and psychological well-being of high school students (Ashcraft & Moore, 2009). This occurrence, marked by feelings of stress, worry, and fear when facing mathematics challenges, has been receiving more focus from both teachers and researchers. Recent studies indicate that approximately 93% of adult Americans experience different degrees of math anxiety, frequently originating from their experiences in high school (Beilock & Maloney, 2015). Anxiety and nervousness affect students from diverse backgrounds in educational settings due to multiple factors like

classroom atmosphere, academic standards, and assessments (Thompson, Robertson, Curtis, & Frick, 2013).

Researchers have examined these emotional responses extensively over the years, especially regarding mathematical subjects. A remarkable percentage (90%) of people in the United States describe unfavorable encounters with mathematics, affecting more than 50% of high school pupils (Furner & Duffy, 2002). The term "math anxiety" describes a decrease in confidence and increased emotional discomfort when it comes to math (Rubinstein & Tannock, 2010; Young, Wu, & Menon, 2012). While several studies have looked into math anxiety in adults and teenagers, there is still much to learn about how it affects and appears in younger students (Young, Wu, & Menon, 2012).

The way students perceive their mathematics anxiety plays a crucial role in their academic achievement and future career choices. Understanding these self-perceptions can provide valuable insights for developing effective interventions and support systems (Hater, 1990). Nevertheless, self-perception and the actual situation regarding math anxiety of secondary-level students remain understudied. Additional exploration is necessary to comprehend how mathematical anxiety shapes self-perception and influences Nepali public school students. Such investigation could yield a crucial understanding of the perceived and actual state of mathematical anxiety among twelfth-grade school learners in Nepal.

Determining who is most susceptible to mathematical anxiety is difficult because there are no clear indicators, mainly because it involves intellectual, psychological, and behavioral aspects. Current research shows that even young students in elementary school can feel anxious about mathematics. Students' perceptions of their math anxiety heavily impact their academic success and decisions regarding their future careers. Acquiring information on these self-perceptions can provide important insight for developing effective interventions and support systems (Hater, 1990). Still, there is a shortage of studies examining how high school students view themselves compared to their actual levels of math anxiety. Further investigation is needed to understand how math anxiety affects students' self-esteem in public schools in Nepal. This research could provide valuable information on the prevalence of math anxiety among twelfth-grade students studying in public schools in Nepal.

Statement of Problem

According to Luttenberger, Wimmer, & Paechter (2018), fear of mathematics is a common psychological obstacle that impacts students' academic success and emotional well-being, especially in the context of mathematics education. Many students encounter math anxiety as a major mental hurdle, lacking adequate understanding or support to manage their stress effectively.

The existing education system does not have organized methods to identify and address math anxiety at its onset, especially during important times like high school (Paudel, 2019). Meece, Wigfield, & Eccles

(1990) also pointed out the importance of the teenage years in manipulating math anxiety, which arises from sharp academic pressure and psychological weaknesses in adolescence. The lack of educational support emphasizes the critical necessity for focused intervention tactics that target students' psychological obstacles to understanding mathematics. Moreover, a study conducted by Luneta, & Sunzuma (2022) shows the complex character of math anxiety, indicating that students hold various views on reducing anxiety and time management. The study highlights the individual experiences with math-related psychological challenges, revealing a close to equal divide in perspectives on how to cope with anxiety. To understand students' self-perception, anxiety sources, and how to improve it, a comprehensive research approach is needed, as it will impact educational techniques and mental health services. In this context, the following objectives have set to identify the actual self-perception and the anxiety sources.

Objectives of the study

The objectives of the study were

1. To identify students' self-perception of mathematics anxiety
2. To explore the first experiences of mathematics anxiety across different stages of study
3. To explore students' perceptions in the minimization of mathematics anxiety

To fulfil the above objective of the study, the following research questions were constructed:

1. What percentage of students experience mathematics anxiety?
2. At what educational stage do students first experience mathematics anxiety?
3. How do students perceive their ability to reduce mathematics anxiety?
4. Do students believe mathematics anxiety naturally diminishes with time?

Theoretical and empirical literature review

For many individuals experiencing math anxiety, strong negative feelings and emotions can significantly harm their performance during mathematics instruction. Math anxiety has been defined as "feelings of tension and anxiety stemming from the manipulation of numbers and solving mathematical problems" (Sorvo et al., 2017). These detrimental beliefs about mathematics can emerge at any age, negatively impelling performance across various mathematical domains, including computation, problem-solving, and even mental calculations (Ramirez et al., 2016; Ramirez et al., 2013; Sorvo et al., 2017). Research has consistently demonstrated a direct correlation between math anxiety and reduction in mathematical accomplishment (Hembree, 1990). Furthermore, math anxiety has been identified as a negative conjecturer of skills mastery, successful decision-making, and the ability to generalize mathematical concepts to real-world situations (Ramirez et al., 2013).

The impact of math anxiety extends beyond the classroom, affecting various aspects of academic and personal development. Worldwide, traits of math anxiety is demonstrated underwrite negatively to the accomplishment of mathematics assignments, class involvement, and even graduation rates (Schoenfeld & Mathur, 2009). Such disapproving traits could exert a long-lasting destructive impact on mathematical enactment and accomplishment, potentially affecting students' forthcoming selections and overall attainment (Ashcraft, Krause & Hopko, 2007; Wu et al., 2012; Young et al., 2012). The pervasive nature of math anxiety underscores the importance of early intervention and support strategies to mitigate its effects and promote positive mathematical experiences for students across all educational levels.

Math anxiety is closely related to both trait and state anxiety, as described in general anxiety research (Hembree, 1990; Miller & Bischel, 2004). Trait anxiety refers to a tendency to experience anxiety across various situations, while state anxiety arises under particular situations; both types can affect work and assignment accomplishment (Miller & Bischel, 2004). Persons having general anxiety are also more probably have mathematics anxiety (Hembree, 1990). The manifestations of math anxiety can be both interior and exterior (Akin & Kurbanoglu, 2011), ranging from physical indications like difficulty in breathing, trembling, and nausea to psychological effects such as decreased self-determination, frustration, despondency, feelings of triviality, and irritation.

The National Council of Teachers of Mathematics (NCTM) recognizes math anxiety as a genuine concern that affect learners in the classroom (Furner & Duffy, 2002). To address this concern, the NCTM has outlined several goals for mathematics teachers regarding student character development such as: (a) fostering student confidence in mathematics, (b) encouraging reflective problem-solving practices, and (c) cultivating an appreciation for mathematics and its relevance to students' daily lives (Furner & Duffy, 2002). By focusing on these aspects, educators can work towards justifying the effects of math anxiety and creating a more positive mathematical learning environment for students.

While research on math anxiety in young elementary school children is limited, evidence suggests that its characteristics can emerge as early as first grade, coinciding with the expansion of basic mathematical skills (Sorvo et al., 2017; Young et al., 2012). Notably, young students are identified as the utmost vulnerable to performance decrements due to math anxiety (Ramirez et al., 2013). Studies involving secondary students have employed diverse settings and approaches to investigate the development of math anxiety and its impact on academic performance and achievement. Luneta, & Sunzuma (2022) pointed out the necessity of anxiety recognition and management strategies in educational settings.

Meece, Wigfield, & Eccles (1990) highlighted the high school period as a critical phase for mathematical anxiety development since it is the stage of academic complexity and psychological vulnerabilities

during adolescence. It creates challenges for young children in reliable and developmentally appropriate solution. This highlights the need perception identification to better understand and address math anxiety in younger populations.

Methodology

The data for this study was gathered by using a survey method. The quantitative design, as suggested by Creswell and Creswell (2017) was used for the collection of quantitative data whereas the qualitative date was collected through structure interviews to the more anxious students. Since, the primary objective of quantitative research is to assess causal relationships within a value-free framework as stated by Johnson and Onwuegbuzie (2004). Altogether, 150 secondary school (of grade 12) student participants were randomly selected from randomly selected four public secondary schools of Kathmandu. Five students who believed that they have more math anxiety and their teacher were purposively selected for semi-structured interviews to collect their experiences and views regarding their mathematics anxiety as qualitative data.

Analysis and Interpretation Procedure

The researchers applied the Statistical Package for the Social Sciences (SPSS-20) to analysis the gathered data. The descriptive statistics (Frequency and Percentage) were computed for the analysis of the data. Moreover, the experiences regarding mathematics anxiety were collected from semi-structured interviews and analyzed thematically. The results, thus, obtained were interpreted with the help of collected data and validated with the findings of earlier empirical research and theoretical inputs.

Findings of the Study

The findings obtained by analyzing both quantitative and qualitative data were presented and interpreted with the different tables and themes. The following table represents the perception of students in mathematics anxiety.

Students' self-perception of mathematics anxiety

To identify the self-perception of the students regarding their mathematics anxiety, the researchers collected the responses from the respondents whether they felt mathematics anxiety or not. The following Table 1 represent the students' realization of their mathematics anxiety.

Table 1.

Descriptive Statistics of Self-Realization of Mathematics Anxiety before Class

Responses	Frequencies	Percentages
Yes	90	60.0
No	55	36.7
Don't Know	5	3.3
Total	150	100.0

Table 1 shows that out of 150 respondents 90 (60%) respondent said that they have mathematics anxiety, 55(36.7%) said they have no mathematics anxiety and only five (3.3%) of the respondents said that they have no any idea about anxiety in mathematics. This shows that more than 36 percent of the respondents thought that they have no anxiety.

After preliminary survey the researchers took a class of 30 minutes to the participants regarding the symptoms of math anxiety, briefly described the consequences of math anxiety as an educational intervention. The researcher took a post-survey after the completion of the class and the result has been listed in table 2.

Table 2.

Descriptive Statistics of Self-Realization of Mathematics Anxiety after Class

Responses	Frequencies	Percentages
Yes	130	86.67
No	20	13.33
Total	150	100.0

After the class, some students changed their opinion regarding math anxiety, which is shown in Table 2. Out of 130 (86.67%) of the respondents said that they have mathematics anxiety, only 20 (13.33%) said they have no mathematics anxiety. All of the respondents made their opinion on either "*Yes, I have math anxiety*" or "*No, I have no math anxiety*". None of the respondents has response, as "*I do not know about math anxiety*". This indicates that the majority (86.67%) of the students felt they have math anxiety.

The researchers noticed some students who changed their opinions in two surveys before and after class and later asked "*why you change your views*?" all of those students replied the same line of expression "*I do know about mathematics anxiety and its' consequences. No one aware me about that before.*" Those expressions of the students indicate the necessity of educational intervention.

First Experience of Mathematics Anxiety

The study found the frequency and corresponding percentage of the responses that the student felt mathematics anxiety at the first time in different levels of their schooling from elementary, middle, high school and never felt the anxiety. The following Table 3 represents the first time students experienced math anxiety

Table 3.

Students First time Experienced Mathematics anxiety

Level	Frequencies	Percentage
Elementary	28	18.7

Table 4.

Descriptive students of the support to reduce mathematics anxiety

Responses	Frequencies	Percentage
Myself	102	68.0
Teachers	38	25.3
Friends	10	6.7
Total	150	100.0

Table 4 reveals critical insights into students' perceptions of mathematics anxiety justification. A significant majority of 68% (102 students) believe they can independently reduce their mathematics anxiety, indicating a strong sense of self-efficacy and personal agency in managing psychological barriers. This high percentage suggests students recognize their internal capacity to address and potentially overcome mathematical stress through personal strategies.

A quarter of the respondents (25.3%, 38 students) attribute potential anxiety reduction to teachers, highlighting the important role of educational professionals in supporting students' psychological well-being. Teachers are viewed as potential facilitators in helping students manage and mitigate mathematics anxiety through supportive teaching strategies, personalized guidance, and emotional support. On the other hand, a minimal proportion of students (6.7%,) 10 students) perceived friends as sources of anxiety reduction, which implies that peer support may be less influential in addressing mathematics anxiety compared to self-management and teacher intervention. This finding highlights the importance of focusing on individual and institutional approaches to mathematics anxiety management more willingly than relying on peer support mechanisms.

Moreover, these results indicated the significance of individual psychological strategies and self-efficacy in addressing academic stress, suggesting that empowering students with self-management tools could be a critical approach in reducing mathematics anxiety.

Table 5.

Descriptive Statistics of Mathematics Anxiety Diminished with Time

Responses	Frequencies	Percentage
Yes	77	51.3
No	73	48.7
Total	150	100.0

The analysis of Table 5 reveals a nuanced perspective on mathematics anxiety resolution, with a slight majority of 51.3% (77 students) believing that mathematics anxiety naturally diminishes over time, while 48.7% (73 students) argue that extra efforts are necessary for anxiety reduction. This nearly equal division suggests a complex and subjective understanding of mathematics anxiety management. The marginal

difference indicates that students hold diverse perspectives on the temporal nature of mathematical psychological barriers. While slightly more than half believe time itself can alleviate anxiety, a substantial proportion recognize the need for practical intervention and continued strategies. It challenges the assumption of a universal resolution mechanism and highlights the need for personalized psychological support that acknowledges the unique experiences and coping mechanisms of individual students.

Discussion

The study identified that a majority of students, 60% (90 students), admitted to experiencing math anxiety, while 36.7% (55 students) claimed not to have it, and 3.3% (5 students) were unsure of their anxiety towards math. This initial finding demonstrates the extent to which mathematical anxiety is prevalent among students. This finding agrees with research done by Luttenberger, Wimmer, & Paechter (2018), which suggests that math anxiety is a common problem for numerous students and could affect their academic achievements and psychological well-being.

After attending a focused 30-minute lesson on the symptoms and consequences of mathematics anxiety as an educational intervention, students noticed a significant shift in their self-perception. The post-intervention survey revealed a notable increase in the recognition of anxiety, with 86.67% (130 students) now admitting to experiencing mathematical anxiety, in contrast to the initial 60%. This significant shift underscores the significance of promoting awareness and educational strategies to help students recognize and understand their emotional responses to mathematics. It suggests that targeted psychological education can substantially enhance students' self-awareness, as demonstrated by Luneta, & Sunzuma (2022) study on the beneficial impacts of recognizing and managing anxiety in education.

The study provides insights into the development of math anxiety in students, with findings indicating that 48% (72 participants) experienced it in high school, 20% (30 students) in middle school, and 18.7% (28 students) in elementary school. The findings back up Meece, Wigfield, & Eccles (1990) views, highlighting the significance of the high school period in the development of math anxiety, potentially influenced by increased academic pressure and emotional vulnerability in adolescence. High school students' self-perception in mathematics and emotional responses to mathematics instruction can be affected by educational experiences, teaching techniques, and psychological factors, which may result in anxiety development (Deieso & Fraser 2019; Paudel, 2019)

The study revealed intriguing results regarding students' perspectives on math anxiety mitigation, with 68% (102 students) feeling they could alleviate their anxiety independently, 25.3% (38 students) looking to teachers for assistance, and a simple 6.7% (10 students) considering friends as a

potential support system. This reliance on oneself for handling mathematical anxiety is with the findings of Johnson and Lee (2021), who highlight the significance of personal psychological strategies and belief in one's abilities in dealing with academic stress. The large number of students who have confidence in their ability to control anxiety implies they may have resilience and take proactive steps to tackle mathematics difficulties.

Interestingly, the study found that around half of the students (51.3%, 77 students) find it intriguing that math anxiety diminishes with time, while the remaining half (48.7%, 73 students) think that more effort is required to reduce mathematical anxiety. Luneta, & Sunzuma (2022) argue that addressing mathematics anxiety requires specialized interventions and continuous strategies, rather than just quick, temporary solutions. The nearly equal split shows that managing anxiety is based on personal experience, highlighting the importance of personalized strategies for conquering psychological hurdles in mathematics.

Conclusion and Implications

The study offers a comprehensive understanding of mathematics anxiety among students, highlighting the notable occurrence of psychological obstacles in math. The research showed that 60% of students were anxious at first, but this number rose to 86.67% after a teaching intervention, emphasizing the importance of focused psychological education. The almost equal split in opinions on resolving mathematics anxiety indicates the need for personalized methods in managing math anxiety. The findings indicate that the majority of math anxiety is present in high school (48%), underlining the importance of providing psychological assistance and intervention during this critical stage of growth.

The research has significant practical consequences for educational institutions and psychological support systems. Key recommendations consist of implementing early intervention programs, developing customized self-assistance resources, and training educators on managing math anxiety. It is anticipated that 68% of the students develop effective coping mechanisms by believing in their ability to handle anxiety independently. One significant drawback of the research is its rather limited sample size of 150 students, which could hinder the generalizability of the results to larger student demographics structure. Future investigations should prioritize conducting longitudinal research to follow the extended effectiveness of intervention methods and enhance comprehension of the psychological mechanisms behind mathematical anxiety.

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