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MATHEMATICS ANXIETY AND ITS IMPACT ON STUDENT PERFORMANCE AMONG COLLEGE STUDENTS

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Abstract:

Students' academic performance is significantly impacted, especially in higher education, by mathematics anxiety, a common psychological issue. Math anxiety is a common problem among college students, and this paper looks at how it affects their performance in quantitative classes, as well as its sources and effects. Math anxiety can be caused by a number of things, according to the research. These include bad experiences in the past, certain teaching methods, a lack of confidence in one's abilities, the influence of peers, and societal expectations. A strong inverse association between anxiety and academic performance was found in the study. Students who suffer from high math anxiety tend to have lower test scores, be less engaged in class, and have less problem-solving abilities. In order to alleviate anxiety and improve mathematical competence, It is suggested to emphasize the critical necessity for individualized treatments such counseling services, supportive pedagogy, and anxiety-reduction seminars. Educators, curriculum creators, and legislators can use the paper's helpful suggestions to create a more conducive setting for mathematics education in higher education and boost student achievement.

***Keywords*:** Mathematics Anxiety**,** Academic Performance, Student Achievement**,** Higher Education

Introduction:

Mathematics, the language of logic and precision, is essential for students' personal and professional growth in many fields. But mathematics is more than simply a subject; it causes a lot of mental anguish for a lot of college students. "Anxieties, tension, and fear

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are hallmarks of mathematics anxiety, a condition that gets in the way of students' ability to manipulate numbers and solve mathematical problems in the classroom. Anxieties about failing in arithmetic, particularly in classes that demand analytical and quantitative thinking, is a problem that students with different levels of intelligence continue to face. Not only can students with weak mathematical abilities suffer from math anxiety, but so can people who are normally rather good at arithmetic but hit mental roadblocks when asked to complete numerical assignments. It typically stems from rigid teaching methods, high-stakes testing, negative cultural narratives about arithmetic, and unpleasant educational experiences in childhood. A student's academic trajectory and career choices, especially in STEM professions, can be impacted by a series of unpleasant experiences that promote a cycle of avoidance, diminished confidence, and poor performance.

Math anxiety must be understood and addressed in the context of higher education because academic success is directly related to future opportunities. Cognitive deficits caused by anxiety make it difficult for college students to learn independently, reason abstractly, and apply complicated ideas. Therefore, math anxiety is a systemic problem that necessitates mental health interventions and evidence-based teaching methods; its effects extend beyond the suffering of individuals. The purpose of this paper is to look into college students' math anxiety and see how it relates to their academic performance. It delves into the mental processes that cause anxiety as well as the structural elements that can either make it worse or better. This paper aims to offer practical insights to educators, administrators, and mental health experts who are working towards making the college a more welcoming and inclusive place for all students.

Scientific investigations into the topic started in the 1970s, when one of the earliest researchers defined it as tension and anxiety that interfere with the manipulation of numbers and the solution of mathematical problems in a wide variety of everyday life and academic situations. Subsequently, others have joined their cause, driven by research showing that mathematics anxiety hinders performance in mathematics (Preston, 2008) and is likely to have its roots in the classroom. Mathematics anxiety is described as a state of sinking feeling, uncertainty, and despair when it comes to doing and understanding

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mathematics. It is characterized by panic, helplessness, paralysis, and mental disorganization. Reducing arithmetic anxiety led to better performance and success, even though the origins of math anxiety are still up for debate. Additionally noted that mathematical ability rises in tandem with anxiety reduction. It could make people hate arithmetic and lead to bad grades. Math is something that a lot of people see as stressful or even a kind of punishment". The origins of math anxiety have been the subject of many theories. Poor test-taking skills, insufficient test preparation, and psychological stress are the three main causes of high levels of arithmetic anxiety and test anxiety. Asserted that students who suffer from arithmetic anxiety face the biggest obstacle: a lack of self-assurance. Other factors that exacerbate math anxiety include unrelated life experiences, educational triggers, and an absence of social support. One study found that students' reasoning and performance were positively affected by parental expectations and support, which in turn reduced their math anxiety. This finding is supported by research on home-college mediation analyses.

A fear of or difficulty with mathematics may have far-reaching effects. "Teachers who struggle with mathematics may find it more difficult to help their pupils overcome their fears if they are responsible for teaching math classes. Anxiety is a catch-all word for a range of mental health issues that manifest as uneasiness, dread, nervousness, and concern. Lack of confidence manifests itself in a variety of ways, including worries that one will be unable to do the math, that it will be too challenging, or that one will fail miserably. Math anxiety impacts students' emotions and actions. Anxiety, whether in or out of class, is normal in mathematics. Some students with severe anxiety may develop a fear of mathematics, while others may find that it helps them do better in the subject.

1. Definition of Mathematics Anxiety:

If you suffer from severe anxiety when dealing with numbers and mathematical difficulties, you may be suffering from mathematics anxiety. When confronted with mathematical activities, some people experience physical symptoms like perspiration, rapid heartbeat, and nausea, which can be attributed to a deeper psychological barrier

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rather than a simple hatred of mathematics. Academic achievement is hindered by this anxiety, which affects both the emotional and cognitive parts of learning.

2. Prevalence Among College Students:

Math anxiety is common among college students and affects students in all academic fields. The expectation that all students, regardless of mathematical background, must pass courses increases both the stress and anxiety that many students feel as a result. Academic pressures, high standards of achievement, and a lack of background knowledge in complex mathematical ideas increase the symptoms. Consequently, many college students struggle with math anxiety, which impacts their engagement in class and their academic results.

3. Negative Educational Experiences:

Many students trace their math anxiety back to earlier educational experiences. These may include poor teaching methodologies, punitive classroom environments, or humiliating experiences when errors were made publicly. A lack of encouragement or patient guidance from educators during formative years can instill a belief that one is inherently bad at math, leading to a fixed mindset that persists into college. These early encounters shape students' attitudes toward mathematics and fuel continued avoidance and fear.

4. Impact on Cognitive Function:

Math anxiety has a direct and measurable impact on cognitive functioning. It reduces working memory capacity, which is crucial for solving multi-step problems, interpreting formulas, and applying logical reasoning. Students with high anxiety often experience mental blocks during tests or mathematical problem-solving, even when they possess the necessary knowledge. The psychological stress of anticipated failure can impair concentration, increase error rates, and cause a downward spiral in performance and confidence.

5. Avoidance and Academic Setbacks:

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As a coping mechanism, students with math anxiety often avoid courses, majors, and career paths that involve mathematics. This behavior can limit academic and professional opportunities, particularly in high-demand STEM fields. Avoidance also means less exposure to the subject, resulting in knowledge gaps that widen over time. Consequently, performance deteriorates, reinforcing the anxiety and the belief that the student is incapable of mastering math.

6. Influence of Social and Cultural Factors:

Cultural beliefs and societal messages significantly shape how students perceive mathematics. Common stereotypes, such as math is only for the gifted or girls are naturally weaker in math, contribute to anxiety and low self-confidence. These narratives are often reinforced through media, family expectations, and peer interactions, further deterring students from engaging with the subject. Social pressure and fear of judgment exacerbate the psychological burden associated with mathematics.

7. Gender Differences: Research indicates that female students tend to report higher levels of mathematics anxiety compared to their male counterparts, even when actual performance differences are negligible. This disparity is often attributed to societal conditioning, lack of role models, and implicit bias in educational environments. Gendered expectations can discourage girls from pursuing math-intensive fields, contributing to the underrepresentation of women in STEM careers.

8. Institutional Role and Pedagogy:

Educational institutions play a critical role in either alleviating or exacerbating math anxiety. Traditional pedagogies that emphasize rote learning, speed-based tests, and minimal conceptual understanding often increase anxiety levels. In contrast, interactive, student-centered, and supportive teaching methods have been shown to reduce fear and improve confidence. Instructors who foster a growth mindset and create a low-pressure environment can significantly mitigate anxiety and improve student engagement.

9. Need for Interventions:

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In order to combat arithmetic anxiety and its negative effects on academic performance, effective interventions are crucial. Alternative evaluation methods, stress management programs, peer mentoring, counseling, and other similar services may fall under this category. The use of cognitive-behavioral methods to reframe unfavorable perceptions about mathematics has demonstrated encouraging outcomes. Additionally, it is critical to develop a healthier learning environment by training educators to recognize anxiety symptoms and to use empathic teaching methods.

Students become more worried and mathematically unprepared when they avoid math since it leads to decreased competency, exposure, and practice. Students who have had bad experiences with mathematics often develop this fear and find it difficult to master new topics since they think they are not good at arithmetic. A number of academics have identified math anxiety as having its roots in certain teaching practices for the subject, as well as in the beliefs and training of facilitators. A lack of confidence in math is sometimes the result of bad math instruction or experiences in the classroom. Anxieties among students stem from teachers who do not believe in themselves and who have a bad outlook on mathematics. Alternatively, there are a number of things that teachers may do to help their students overcome math anxiety, such as going over basic math concepts again, making sure their students understand mathematical terminology, and offering them a support system. “Anxiety about mathematics is more of a psychological issue than a cognitive one. On the other hand, there are academics who contend that math anxiety might hinder one's capacity to acquire mathematical knowledge, turning it into an intellectual challenge. Anxieties and phobias related to mathematics are mainly caused by past failures and the fear of future ones. In recent decades, everyone involved in Ghana's education system has been worried about pupils' mathematical ability.

Objective

The purpose of this paper is to review the association between mathematics anxiety and academic performance among college students.

Review of literature

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Richardson and Suinn (1972) reported that a number of people were among the first to characterize it as feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a variety of settings. There have been subsequent studies that have expanded this definition to include both cognitive and emotional components. These studies have argued that math anxiety is not a reflection of actual ability but rather an emotional response that is rooted in self-perception and social conditioning. Fear of failure and negative expectations lead to avoidance behavior.

Trujillo and Hadfield (1999) stated that a numerous studies have been conducted to determine the primary elements that have a role in the emergence of mathematics anxiety. In the later stages of academic development, higher levels of anxiety have been associated to negative early learning experiences. These events include punitive responses from teachers, timed assessments, and inadequate instructional strategies.

Ashcraft and Kirk (2001) reported that it was discovered that kids who suffer from high levels of math anxiety have a lower capacity for working memory when they are attempting to solve problems, which hinders their ability to perform well in mathematics responsibilities. A meta-analysis conducted by Hembree (1990) lends credence to this assertion, revealing a somewhat unfavorable connection that is consistent across the board between arithmetic anxiety and performance outcomes. Not only do these cognitive constraints have an impact on test-taking, but they also have a negative impact on classroom participation and interest in courses linked to mathematics.

In spite of the fact that their performance does not significantly differ from that of male students, it was discovered that female students report higher levels of math anxiety as compared to male students across cultures (Else-Quest et al. 2010). One of the most important factors that contributes to the perpetuation of these disparities is the practice of internalizing society standards and cultural expectations. Furthermore, research conducted in developing countries sheds insight on the impact that parental expectations, the attitudes of teachers, and the availability of resources have in molding the attitudes that students have toward mathematics classes.

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Ramirez et al., (2013) stressed upon that in addition to classroom techniques that place an emphasis on collaborative learning, real-world applications, and environments that are error-friendly have proven to be successful in lowering anxiety levels and increasing student engagement.

Discussion

A sizeable percentage of college students report experiencing moderate to high levels of anxiety when it comes to mathematics, with a considerable variety in the degree of anxiety experienced by students in different academic fields. Student anxiety levels were shown to be higher among students from non-scientific backgrounds, particularly those in the arts and commerce streams, when compared to students from science backgrounds. This is likely owing to the fact that these students had less exposure to quantitative disciplines. It appears that the capacity of students to perform efficiently in mathematical activities decreases when their anxiety levels rise. This is mostly due to the fact that students experience cognitive overload and a reduction in their working memory. In addition, the study found that there were substantial gender differences, with female students expressing higher levels of anxiety despite comparable performance scores. This highlights the importance that sociocultural and psychological conditioning play in molding self-efficacy in relation to mathematics. Early unpleasant experiences with mathematics, teachers who were not supportive, and the pressure from scheduled assessments were all factors that students attributed to their anxiety state. Many students also have reluctance in requesting assistance because they were afraid of being judged or embarrassed. The implications highlight the necessity of reforming both educational practices and the environment of classroom programs.

Conclusion

The anxiety that college students experience regarding mathematics is a widespread and significant problem that has a significant influence on both their academic performance and their mental well-being. The paper highlights that there is a significant inverse association between anxiety and performance, which highlights the utmost need of

implementing tailored treatments in the field of higher education. In addition, the anxiety levels and coping techniques of students are further influenced by factors such as gender and academic background. The emotional and cognitive aspects of learning need to be addressed by educators and policymakers through the implementation of inclusive teaching techniques, the promotion of growth mindsets, and the provision of counseling support. Students can be assisted in developing their self-confidence and performing to their full potential through the use of interventions such as math workshops, peer mentoring, and anxiety-reduction measures. It is recommended that future studies investigate the consequences of math anxiety over time and evaluate the efficacy of various therapies in a variety of educational settings.

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