IMPACT OF MATHEMATICS ANXIETY ON ACADEMIC PERFORMANCE OF NIGERIA CERTIFICATE IN EDUCATION STUDENTS

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Abstract

Mathematics anxiety has become a major concern in educational institutions as it negatively affects students' interest, confidence, performance, and overall achievement in mathematics. This study examined the impact of mathematics anxiety on the academic performance of NCE students at Federal College of Education (Technical) Bichi. Using a descriptive survey design, data were collected from 1,342 NCE II students across six schools in the institution through a structured questionnaire. The data were analyzed using frequencies, percentages, means, and standard deviations. Findings revealed that many students experience moderate to high levels of mathematics anxiety, which negatively affects their classroom participation, problem-solving skills, confidence, and academic performance. Major causes of mathematics anxiety include fear of failure, weak foundational knowledge, negative classroom experiences, and low self-confidence. The study concluded that mathematics anxiety is a significant obstacle to effective mathematics learning among NCE students. It recommended the use of learner-centered teaching methods, supportive classroom environments, and strengthened counselling and mathematics support programs to reduce anxiety and improve students' academic performance.

Keywords: Academic Performance; Mathematics Anxiety; General Mathematics; NCE Students

1.0 Introduction

Mathematics occupies a central position in the educational system of every nation because it serves as the foundation for scientific innovation, technological advancement, economic development, and logical reasoning. The subject plays a vital role in everyday decision-making and is a prerequisite for many disciplines such as engineering, medicine, economics, computer science, and education. Despite its importance, mathematics remains one of the subjects most feared by students at different levels of education. Many learners experience feelings of tension, worry, nervousness, and fear whenever they are required to learn, practice, or solve mathematical problems. This emotional reaction, commonly referred to as mathematics anxiety, has become a major concern among educators, psychologists, and researchers because of its influence on students' academic success and attitude toward mathematics (Namkung et al., 2019; Pizzie & Kraemer, 2023).

Recent scholarly attention has highlighted mathematics anxiety as one of the major affective factors influencing mathematics learning. Contemporary research indicates that mathematics anxiety affects students' cognitive processing, working memory, concentration, and motivation, thereby hindering academic achievement (Foley et al., 2023; Zhang et al., 2026). A recent scoping review of empirical studies identified mathematics performance as the most frequently examined outcome of mathematics anxiety and noted that environmental factors such as

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teachers, peers, and classroom experiences significantly contribute to its development (Zhang et al., 2026).

Globally, mathematics anxiety has become a widespread educational challenge. Research has shown that students experiencing mathematics anxiety often develop maladaptive study habits, avoid mathematics-related tasks, and perform below their actual academic potential (Pizzie & Kraemer, 2023). Similarly, recent meta-analytic evidence reported a significant negative relationship between mathematics anxiety and mathematics performance, indicating that increased anxiety is associated with lower academic outcomes (Namkung et al., 2019; Sharma & Bala, 2025).

Several factors have been identified as contributors to mathematics anxiety, including ineffective teaching methods, poor foundational knowledge, family expectations, negative classroom experiences, and low self-confidence (Kour & Dhull, 2024). Research further suggests that supportive teaching practices, positive classroom interactions, and counseling interventions can significantly reduce mathematics anxiety and improve students' learning outcomes (UNESCO, 2023; Kour & Dhull, 2024).

In Nigeria, mathematics anxiety continues to pose a significant challenge to educational development. Studies have consistently shown that mathematics anxiety predicts students' academic achievement and influences their participation in mathematics-related activities (Adeleke & Yusuf, 2023; Okoronkwo & Wonu, 2023). Research conducted among secondary school students revealed that fear of failure, poor mathematical background, and negative perceptions of mathematics contribute substantially to mathematics anxiety and poor performance (Adeleke & Yusuf, 2023).

Within Kano State and Northern Nigeria generally, concerns regarding students' poor performance and low interest in mathematics remain prevalent. Although several studies have investigated mathematics anxiety among secondary school students, limited research has focused on NCE students in Colleges of Education, particularly at the Federal College of Education (Technical), Bichi. This gap in the literature necessitates further investigation into how mathematics anxiety affects mathematics learning among prospective teachers.

Furthermore, structural obstacles such as overloaded and outdated curricula, rigid or traditional instructional approaches, lack of student motivation, and inadequately resourced institutional facilities continue to impede effective learning outcomes in Nigerian tertiary teacher-education programs (Adewumi et al., 2024).

According to different studies, the major factors of learning mathematics that leads to anxiety are categorized as shown in Figure 1.

FACTORS OF LEARNING MATHEMATICS (Independent Variables)

[Teacher Factor] • [Student Factor] • [Parent Factor] • [Nature of the Subject] • [Socio-Cultural / Economic Factor]

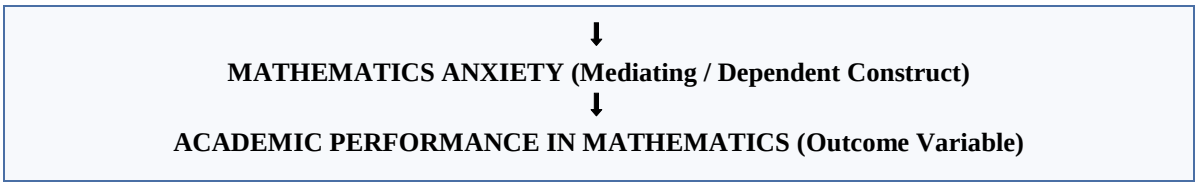

Figure 1: Conceptualization of the Study

Given these factors, it is difficult for students to overcome their anxiety and improve their performance and attitude toward mathematics if their teachers also struggle with the subject. Thus, it is essential to explore the root causes of mathematics anxiety in students. Many pre-service teachers perceive mathematics as the most challenging subject because they lack confidence in their ability to understand it. This leads to the question: how will these students teach mathematics effectively in the future? Consider how these feelings could influence future students and the impact on subsequent generations.

The independent variable of this study is factors causing mathematics anxiety, comprising teacher factors, student factors, parent factors, nature of mathematics, and socio-cultural/economic factors. These factors are considered predictors of the dependent variable, mathematics anxiety among NCE II students. The study seeks to determine the relative contribution of each factor to the development of mathematics anxiety and to identify the most influential factor among the students.

1.1 Purpose of the Study

This study aimed to examine the impact of mathematics anxiety on the academic performance of NCE students. The specific objectives are to:

- Investigate the level of mathematics anxiety among NCE mathematics students.
- Identify the causes of mathematics anxiety among the students.
- Find the relationship between the students' academic performance in mathematics and their level of mathematics anxiety.

1.2 Research Questions

The study seeks to answer the following research questions:

- What is the level of mathematics anxiety among NCE students of Federal College of Education (Technical), Bichi?
- What are the major causes of mathematics anxiety among NCE students of Federal College of Education (Technical), Bichi?
- What is the relationship between students’ mathematics anxiety levels and their academic performance in mathematics?

1.3 Research Hypotheses

The following null hypotheses were formulated for the study:

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H_{01}: There is no significant difference in the contribution of teacher factors, student factors, parent factors, nature of mathematics, and socio-cultural/economic factors to mathematics anxiety among NCE II students in FCE(T) Bichi.

H_{02}: There is no significant relationship between students' mathematics anxiety levels and their academic performance in mathematics.

2.0 Literature Review

2.1 Concept of Mathematics Anxiety

Mathematics anxiety has become an important area of research in mathematics education because of its potential influence on students' attitudes, learning experiences, academic achievement, and willingness to engage with mathematics. It is generally understood as a feeling of tension, apprehension, fear, or discomfort that interferes with an individual's ability to manipulate numbers, solve mathematical problems, or participate effectively in mathematical situations. Mathematics anxiety is therefore different from ordinary dislike of mathematics or a temporary feeling of difficulty. Rather, it represents an effective response that may become sufficiently strong to interfere with mathematical thinking and performance.

The contemporary literature suggests that mathematics anxiety should be understood as a multidimensional phenomenon rather than as a simple indicator of low mathematical ability. Students may experience anxiety when attending mathematics classes, studying mathematical concepts, completing assignments, solving problems, or taking mathematics examinations. Consequently, students who possess adequate mathematical knowledge may nevertheless perform poorly when anxiety consumes the cognitive resources required for mathematical reasoning and problem-solving. A large meta-analysis involving 177 studies and more than 900,000 participants demonstrated the importance of examining the complex relationships among mathematics performance, mathematics anxiety, test anxiety, cognitive factors, gender, age, and task characteristics (Barroso et al., 2021). The findings reinforce the argument that mathematics anxiety is associated with mathematics-related outcomes but that the strength of the relationship can vary according to individual and contextual factors.

2.2 Mathematics Anxiety Among College and University Students

The transition from secondary education to higher education may expose students to increased academic demands and more complex mathematical content. Students in colleges and universities may encounter mathematics, statistics, quantitative reasoning, or research methods as compulsory components of their programmes. For students who already possess negative attitudes or low confidence in mathematics, these academic requirements may intensify anxiety.

Khasawneh et al. (2021) reviewed the impact of mathematics anxiety among university students and identified the importance of understanding the factors associated with anxiety in higher education. Their review is relevant to the present study because university and college students operate within academic environments that differ from those of secondary school students. The

autonomy expected of higher-education students, the complexity of mathematical tasks, assessment pressure, and previous experiences with mathematics can all contribute to anxiety.

Similarly, research on mathematics and statistics anxiety indicates that anxiety can be connected with students' perceptions of their own competence and their approaches to learning. Trassi et al. (2022), in a systematic review and meta-analysis of statistics anxiety among university students, identified self-efficacy, learning strategies, procrastination, and self-awareness among factors relevant to anxiety. Although statistics anxiety is not identical to mathematics anxiety, the findings have implications for mathematics education because many students encounter both mathematics and statistics within higher education. The study also highlights the importance of examining psychological and behavioural variables rather than treating anxiety as an isolated phenomenon.

Zanabazar et al. (2023) also examined the relationship between mathematics anxiety and mathematical performance among undergraduate students. Their work is relevant to the present study because it provides evidence that mathematics anxiety remains a significant issue at the undergraduate level. The relationship between anxiety and performance is especially important in teacher education, where students' mathematical competence is necessary not only for passing examinations but also for developing the knowledge and confidence required for effective future teaching.

The growing body of research therefore suggests that mathematics anxiety should not be regarded solely as a problem affecting children or secondary school learners. It is also relevant to students in tertiary education. This observation is important for NCE programmes because NCE students occupy an intermediate position between secondary education and university-level teacher education. Their experiences may differ from those of conventional university undergraduates, yet the literature has rarely treated them as a distinct population.

2.3 Mathematics Anxiety and Academic Achievement

One of the most extensively investigated aspects of mathematics anxiety is its relationship with academic achievement. The general assumption is that higher levels of anxiety are associated with lower mathematical performance. However, contemporary research suggests that the relationship is more complex and may be influenced by cognitive, affective, and contextual factors.

Barroso et al. (2021) conducted a large meta-analysis involving 177 studies and 906,311 participants. Their findings examined different forms of anxiety, including mathematics anxiety and test anxiety, and considered moderators such as age, gender, working memory, mathematical task type, and learning materials. The scale of this meta-analysis provides strong evidence that anxiety and mathematics performance are interconnected but that the relationship cannot be explained by a single factor.

For NCE students, this relationship deserves particular attention. Mathematics courses in teacher education may involve abstract concepts, problem-solving, algebra, calculus, statistics,

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geometry, and other areas requiring sustained cognitive engagement. When students experience high anxiety, they may have difficulty concentrating, recalling mathematical procedures, or applying previously learned concepts. Consequently, poor academic performance may sometimes reflect not only inadequate mathematical knowledge but also the cognitive consequences of anxiety.

The relationship may also operate in the opposite direction. Students who repeatedly perform poorly in mathematics may develop negative beliefs about their mathematical abilities, which can increase anxiety during subsequent mathematical activities. This creates a possible cycle in which anxiety contributes to poor performance, poor performance reduces confidence, and reduced confidence subsequently increases anxiety.

Recent studies among college and undergraduate students have continued to emphasize this relationship. Dai and Jamaludin (2025), for example, examined the influence of mathematics anxiety on college students' learning and performance, with attention to factors such as self-efficacy and problem-solving. Such findings support the view that mathematics anxiety should be examined alongside students' beliefs about their own mathematical competence. A student who believes that mathematics is beyond his or her ability may experience greater anxiety when faced with mathematical tasks than a student who possesses similar mathematical knowledge but has stronger self-efficacy.

The implication for NCE students is that mathematics achievement alone may not provide a complete picture of their mathematical experiences. Research that examines both anxiety and academic performance can provide a more comprehensive understanding of why some students struggle with mathematics despite having received similar instructional opportunities.

2.4 Mathematics Anxiety Among Pre-Service Teachers

The issue of mathematics anxiety among pre-service teachers is especially relevant to NCE education. Unlike students in many other disciplines, student teachers are preparing for a profession in which they may be expected to teach mathematics directly or support learners' mathematical development.

Costado Dios and Piñero Charlo (2024) examined mathematical anxiety among students in primary education degree programmes in the post-pandemic period. Their work demonstrates the continued relevance of mathematics anxiety within teacher education and highlights the need to understand how future teachers experience mathematics. This is significant because pre-service teachers' beliefs and emotional responses toward mathematics may influence their future classroom practices.

If a future teacher is anxious about mathematics, that anxiety may affect lesson preparation, willingness to use innovative teaching strategies, confidence in explaining mathematical concepts, and responses to students' errors. There is also a possibility that negative attitudes toward mathematics may be transmitted indirectly to pupils through teacher behaviour.

Therefore, studying mathematics anxiety among NCE students has implications beyond the students themselves.

The NCE context is particularly important in Nigeria because Colleges of Education contribute substantially to the preparation of teachers for basic and secondary education. Despite this important role, much of the existing mathematics anxiety literature focuses on school pupils or university undergraduates. Consequently, NCE students may be overlooked even though they represent an important group of future educators.

2.5 Mathematics Anxiety in the Nigerian Educational Context

The Nigerian educational context presents particular reasons for examining mathematics anxiety. Mathematics occupies a central position in the education system and is important for progression into many science, technology, engineering, and other quantitative fields. However, persistent challenges in mathematics learning and achievement have generated considerable interest in factors affecting students' performance.

Recent Nigerian research has demonstrated the continuing importance of addressing mathematics anxiety. Egara and Mosimege (2024) investigated systematic desensitization among Nigerian secondary school students, providing evidence that intervention strategies can be used to address mathematics anxiety and achievement. Similarly, Mosimege et al. (2024) investigated group rational emotive behaviour therapy as an approach to mathematics anxiety among secondary school students. These studies demonstrate that mathematics anxiety is recognized as a meaningful educational concern in Nigeria and that psychological interventions may have a role in addressing it.

However, the concentration of recent Nigerian studies on secondary school students creates an important gap. Students entering an NCE programme have already completed secondary education and may bring with them mathematical experiences, attitudes, beliefs, and anxieties developed over many years. The transition to college may either reduce or intensify these experiences depending on the nature of the curriculum, teaching methods, assessment practices, and support systems available.

Thus, findings from secondary school students cannot automatically be generalized to NCE students. NCE students have different academic responsibilities, career aspirations, and exposure to advanced mathematics. They are also preparing to become teachers, making their mathematics anxiety educationally significant beyond their individual academic performance.

3.0 Methodology

3.1 Design of the Study

This study employed an ex post facto research design. According to Creswell and Creswell (2023), ex post facto research involves the investigation of relationships among variables where the independent variable has already occurred and cannot be manipulated by the researcher. Similarly, Ary et al. (2021) describe ex post facto research as a systematic inquiry in which

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researchers seek to determine the causes or consequences of differences that already exist among individuals or groups. The design is therefore appropriate for the present study because mathematics anxiety is an existing psychological condition among NCE mathematics students, and its influence on mathematics learning can only be examined through observation rather than experimental manipulation.

3.2 Population of the Study

The population of the study comprised all one thousand three hundred and forty-two (1,342) NCE II students across the six schools in the college.

3.3 Sampling and Sampling Technique

The sample consisted of three hundred and nine (309) students (250 males and 59 females) drawn from the one thousand three hundred and forty-two (1,342) NCE II students across the six schools in the college.

3.4 Instrument for Data Collection and Validation

The Mathematics Anxiety Scale developed by Rosyita Anindyarini (2019), which has a reliability index of 0.78, was adopted for this study with slight modifications to suit the respondents. The instrument was adjusted to focus on three aspects: cognitive, behavioural, and emotional responses. It was validated by experts in educational Psychology and mathematics. Data for this study were collected for the individual score in General Studies of Education (GSE) 212 mathematics. The collected data were analyzed using an independent samples t-test to determine the levels of Math Anxiety (high and low) and its effects (positive and negative).

The anxiety in mathematics is measured using 20 items. The maximum possible score is calculated by multiplying the highest score per item (4) by the number of items (20), resulting in a total of 80. The minimum score is calculated by multiplying the lowest score per item (1) by the number of items, resulting in a total of 20. The range is 80 - 20 = 60 and dividing this range by 2 gives a midpoint of 30. The cut-off points for determining high math anxiety are 60 (80 - 20 = 60 or 20 + 40 = 60). Therefore, any student who scores 60 or above is regarded as having high math anxiety, while those who scored between 20 and 39 are regarded as having low anxiety. This procedure is consistent across all assessments. The data were analyzed using frequency count, rank, percentage, weighted mean and Pearson's correlation. The scale used in determining the level of anxiety of the respondents is presented in Table 1:

Table 1: Respondent Anxiety Scale

Anxiety Score	Anxiety Level
80–100	Very High Anxiety
60–79	High Anxiety
40–59	Low Anxiety
20–39	Very Low Anxiety

4.0 Results and Discussion

This section discusses the analysis and interpretation of the data on the level of mathematics anxiety of students, its causes, and the correlation of the level of math anxiety of students to their academic performance in the said subject.

4.1 Students' Mathematics Anxiety Levels

Research Question 1: What is the level of mathematics anxiety among NCE students of Federal College of Education (Technical), Bichi?

Table 2: Mathematics Anxiety Level of Students

Level of Mathematics Anxiety	Anxiety Score	Number of Students	Percentage (%)
Very High Anxiety	80–100	106	34.3
High Anxiety	60–79	81	26.2
Low Anxiety	40–59	56	18.1
Very Low Anxiety	20–39	66	21.4
Total	**—**	**309**	**100.0**

Table 2 presents the level of mathematics anxiety among the respondents. Of the 309 respondents, 106 (34.3%) were identified as having High Anxiety in general mathematics, and 81 (26.2%) were diagnosed with Very High anxiety. This means 187 (60.5%) of the students have anxiety in general mathematics. On the other hand, 66 respondents (21.4%) and 56 respondents (18.1%) were diagnosed with Very Low and Low anxiety, respectively. As a whole, only 39.5% of the respondents have no mathematics anxiety, while an overwhelming 60.5% have mathematics anxiety. These findings indicated that the majority of NCE 2 students at FCE(T) Bichi were found to have anxiety in general mathematics.

4.2 Factors Contributing to Mathematics Anxiety Among NCE Students

Research Question 2: What are the major causes of mathematics anxiety among NCE students of Federal College of Education (Technical), Bichi?

Table 3: Factors That Cause Mathematics Anxiety Among NCE II Students in FCE(T) Bichi

Causes of Anxiety	No. of Students	Percentage (%)	Rank
Nature of Subject	130	42.1%	1
Student Factor	62	20.1%	2
Teacher Factor	61	19.7%	3

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Parent Factor	42	13.6%	4
Socio-Cultural/Economic Factor	14	4.5%	5
Total	**309**	**100.0%**	—

Table 3 presents the five major factors identified by respondents as causes of mathematics anxiety. The findings indicates that the nature of mathematics as a subject was the leading cause of anxiety among students. Out of the 309 respondents who reported experiencing mathematics anxiety, 42.1% identified the perceived difficulty of the subject as the primary source of their anxiety. This finding aligns with Shannon (2018), who examined mathematics anxiety and its relationship with students' course preferences in college. The study revealed that students often fear mathematics because mathematical concepts are perceived as difficult to understand.

The second major factor identified was the Student Factor. Sixty-two respondents (20.1%) indicated that student-related factors were the primary cause of their mathematics anxiety. This suggests that some students' anxiety stems not from external influences but from their own attitudes and dispositions toward mathematics, including a tendency to avoid the subject. It can therefore be inferred that these students may not fully recognize the significance and practical relevance of mathematics in their daily lives and future careers.

Closely following this was the Teacher Factor, which was identified by 61 students (19.7%) as a major contributor to mathematics anxiety. The findings suggest that inadequate support and encouragement from teachers may have hindered students' development of mathematical competence and confidence. In addition, mathematics instruction often relied heavily on textbooks, with limited use of interactive teaching approaches such as group discussions, collaborative learning activities, and practical applications. As a result, students may have developed negative perceptions of mathematics, thereby increasing their levels of anxiety toward the subject.

Additionally, 52 respondents (13.6%) identified parental factors as the primary cause of their anxiety. These students lacked confidence in their mathematical abilities, feeling uncertain about whether they would receive adequate support and encouragement at home. Conversely, sociocultural/economic factors and teacher factors accounted for the math anxiety of 14 students (4.5%) and 61 respondents (19.7%), respectively. These figures suggest that sociocultural and economic variables such as background and financial status do not directly influence students' math anxiety levels. By contrast, a teacher's traits and instructional personality significantly shape students' attitudes toward the subject. This aligns with findings by Marshall (2018), who identified teacher-related factors as a primary contributor to math anxiety.

4.3 Correlation of Mathematics Anxiety and Performance in General Mathematics

Research Question 3: What is the relationship between students' mathematics anxiety levels and their academic performance in mathematics?

Table 4: Computed Value of Pearson Correlation

Statistical Analysis	Statistical Data	Interpretation
Degrees of Freedom (df)	86	—
Level of Significance	0.05	—
Computed r-value	-0.6657	Moderate, inverse relationship
Critical t-value	2.0211	—
Computed t-value	5.8998	Reject H_0
Conclusion	**Significant**	**Statistically significant inverse relationship**

It can be observed that 56.5% of the respondents exhibited high levels of mathematics anxiety, while 64.7% demonstrated low academic performance in General Mathematics. This finding prompted the researcher to investigate whether a significant relationship exists between mathematics anxiety and students' academic performance in General Mathematics. To determine the relationship between these two variables, Pearson's Product-Moment Correlation was employed to compare each respondent's mathematics anxiety score with their academic achievement, using a 0.05 level of significance.

The computed Pearson correlation coefficient (r = -0.6657) indicates a moderate negative relationship between students' mathematics anxiety and their academic performance. This result, presented in Table 4, suggests that as students' levels of mathematics anxiety increase, their academic performance tends to decrease.

Furthermore, the calculated t-value of 5.8998 exceeded the critical value of 2.0211 at the 0.05 level of significance, leading to the rejection of the null hypothesis. Based on this result, it can be concluded that there is a statistically significant relationship between the mathematics anxiety levels of NCE students and their performance in General Mathematics courses. Therefore, mathematics anxiety is inversely related to academic performance, implying that higher levels of anxiety are associated with lower academic achievement.

5.0 Conclusion and Recommendations

5.1 Conclusion

The findings of this study clearly show that math anxiety had an impact on the academic performance of the respondents in the subject. Furthermore, the difficult nature of the subject, student factor and parents factor caused the anxiety of the students and thus must be given attention by teachers. Instruction should not only focus on a cognitive aspect of the lesson but psychological as well by enhancing performance by eliminating anxiety among students.

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5.2 Recommendations

Based on the foregoing findings and conclusions, the following recommendations are made by the researchers:

1. A series of mathematics anxiety-awareness programmes, seminars, and symposia should be conducted to advance the significance of mathematics in society.
2. A separate remedial instruction programme should be held catering to the special needs of students suffering from mathematics anxiety and low academic performance in mathematics.
3. For more significant results in the performance level of students in general mathematics, the utilization of a positive approach to lessen mathematics anxiety should be employed to the maximum in every mathematics classroom.
4. Students should be supported in developing the skills to effectively use manipulatives in accordance with the mathematics curriculum.
5. Creating a positive and welcoming classroom environment should be prioritized to enhance a comforting and collaborative learning atmosphere.
6. Teachers should continually have positive conversations about mathematics anxiety with their students to support students' well-being.
7. Students should regularly reflect on their practices to learn from their mistakes; this can improve their learning ability and reduce the level of mathematics anxiety.

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