



Category: STEM (Science, Technology, Engineering and Mathematics)

ORIGINAL

## Math anxiety in Peruvian students of regular basic education: A Descriptive Study

### Ansiedad hacia las matemáticas en estudiantes peruanos de educación básica regular: Un estudio descriptivo

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#### ABSTRACT

**Introduction:** math anxiety among secondary school students is a widely studied and recognized phenomenon in the educational community. This emotional disorder can hinder learning and affect students' emotional well-being.

**Objective:** to describe the level of math anxiety in a sample of Peruvian regular basic education students.

**Methods:** quantitative, non-experimental, and cross-sectional descriptive study. The sample consisted of 150 students of both sexes who were administered the Mathematics Anxiety Questionnaire, an instrument with adequate metric properties. Descriptive statistics were used for analysis.

**Results:** the level of math anxiety for 63,3 % of students was moderate, for 26,7 % it was low, for 6 % it was high, for 3,3 % it was very low, and for 0,7 % it was very high. When evaluating the dimensions of attitudes, emotions, and beliefs, it was found that they were also predominantly rated at the moderate level. This means that the majority of students occasionally feel concern, nervousness, or tension when facing situations related to mathematics in the classroom.

**Conclusions:** the level of math anxiety experienced by the majority of Peruvian regular basic education students is moderate. Therefore, it is suggested to implement emotional support programs that provide tools for managing anxiety, as well as teacher training to identify and support students so they can effectively cope with it.

**Keywords:** Math Anxiety; Attitudes; Emotions; Beliefs; Secondary Education.

#### RESUMEN

**Introducción:** la ansiedad hacia las matemáticas entre los estudiantes de educación secundaria es un fenómeno ampliamente estudiado y reconocido en la comunidad educativa. Este trastorno emocional puede obstaculizar el aprendizaje y afectar el bienestar emocional de los estudiantes.

**Objetivo:** describir el nivel de ansiedad hacia las matemáticas en una muestra de estudiantes peruanos de educación básica regular.

**Métodos:** estudio cuantitativo, no experimental y descriptivo de corte transversal. La muestra estuvo conformada por 150 estudiantes de ambos sexos a quienes se les aplicó el Cuestionario de Ansiedad hacia las Matemáticas, un instrumento con adecuadas propiedades métricas. Para el análisis se utilizó la estadística descriptiva.

**Resultados:** el nivel de ansiedad hacia las matemáticas del 63,3 % de los estudiantes fue medio, del 26,7 % fue bajo, del 6 % fue alto, del 3,3 % fue muy bajo y del 0,7 % fue muy alto. Al evaluar las dimensiones actitudes, emociones y creencias, se encontró que también fueron valoradas predominantemente en el nivel medio. Esto quiere decir que la mayoría de los estudiantes ocasionalmente siente preocupación, nerviosismo o tensión al enfrentarse a situaciones relacionadas con las matemáticas en el aula.

**Conclusiones:** el nivel de ansiedad hacia las matemáticas que experimenta la mayoría de los estudiantes peruanos de educación básica regular es medio. Por lo tanto, se sugiere implementar programas de apoyo emocional que brinden herramientas para la gestión de la ansiedad, así como capacitación docente para identificar y apoyar a los estudiantes para que puedan afrontarla eficazmente.

**Palabras clave:** Ansiedad Hacia las Matemáticas; Actitudes; Emociones; Creencias; Educación Secundaria.

## INTRODUCTION

Mathematics anxiety (MA) is a widely recognized and studied educational and psychological phenomenon.<sup>(1)</sup> From fear of making mistakes to worry about not understanding fundamental concepts, MA can manifest itself in a variety of ways and affect students of all ages and academic levels.<sup>(2)</sup> This emotional disorder can hinder learning and academic performance, as well as influence individuals' self-esteem and emotional well-being.<sup>(3)</sup>

MA was defined as a feeling of tension, apprehension, and anxiety that interferes with the ability to perform mathematically, manipulate numbers, and solve mathematical problems in a wide variety of academic and everyday life situations.<sup>(4)</sup> Since mathematics plays a crucial role in numerous aspects of daily and professional life, understanding and addressing anxiety toward this subject has become a priority in the educational field.<sup>(5)</sup>

Individuals experiencing MA can exhibit a range of symptomatology at various levels: emotional, cognitive, and physiological, leading to adverse outcomes, such as decreased academic performance.<sup>(6,7)</sup> At the emotional level, individuals experience feelings of tension, apprehension, nervousness, and worry.<sup>(8)</sup> On a cognitive level, math anxiety affects working memory functioning.<sup>(9)</sup> On a physiological level, symptoms of MA include increased heart rate, sweating of the hands, upset stomach, and dizziness.<sup>(10)</sup>

From one perspective, it has been proposed that the causes of MA can be classified into three categories: environmental factors, mental factors, and personal factors.<sup>(11,12)</sup> The first category includes negative classroom experiences, inappropriate teaching strategies, family pressure, insensitive teachers, and the use of mathematics as a form of punishment.<sup>(13)</sup> In the second category, mental factors are teaching methods incompatible with the student's learning style, lack of determination, low levels of self-confidence, and lack of belief in the usefulness of mathematics.<sup>(14)</sup> Finally, personal factors that make up the third category include reluctance to ask questions in class due to embarrassment or other similar feelings and low self-esteem.<sup>(15)</sup>

The research focuses on addressing MA in secondary school students in Peru, a subject of academic and social relevance. Anxiety towards this subject can have a significant impact on the academic performance and emotional well-being of students, affecting their integral development. Given that there is a paucity of descriptive research focused on this topic in the Peruvian context, this study will provide detailed insight into students' experience with mathematics, thus contributing to filling a gap in the academic literature and providing crucial information for the design of effective educational interventions aimed at improving both students' academic performance and emotional well-being.

The present research aimed to describe the level of MA in a sample of Peruvian regular primary education students.

## METHODS

The study adopted a quantitative approach with the purpose of collecting data and identifying patterns of behavior within the sample analyzed. The design was non-experimental since it did not involve the manipulation of the MA variable but was limited to observing it in its natural context. In addition, it was categorized as descriptive and cross-sectional since the characteristics of the study variable were explored at a single time point.<sup>(16)</sup>

The population consisted of 245 students of both sexes who were in the third, fourth, and fifth grades of secondary education in an educational institution located in the town of Planchón (Peru). The sample consisted of 150 students. It should be noted that this sample size was determined using a simple random probability sampling method, which ensured a confidence level of 95 % and a significance of 5 %, which guarantees the representativeness of the sample and the validity of the results obtained in the study.

MA was considered as the study variable, which was categorized into 5 levels, considering the following cut-off points: very low (20 - 36), low (37 - 52), medium (53 - 68), high (69 - 84) and very high (85 - 100).

The data collection technique was the survey, while the instrument was the Mathematics Anxiety

Questionnaire.<sup>(17)</sup> This questionnaire assesses various aspects related to the anxiety that individuals experience when faced with situations involving learning, understanding, or performing mathematical tasks. It consists of 20 items with 5 response alternatives ranging from 1 (never) to 5 (always) and presents three dimensions: attitudes (8 items), emotions (6 items), and beliefs (6 items). Previous research conducted in the Peruvian context<sup>(18)</sup> determined that the questionnaire had adequate metric properties (Aiken's  $V = 0,900$ ;  $\alpha = 0,920$ ).

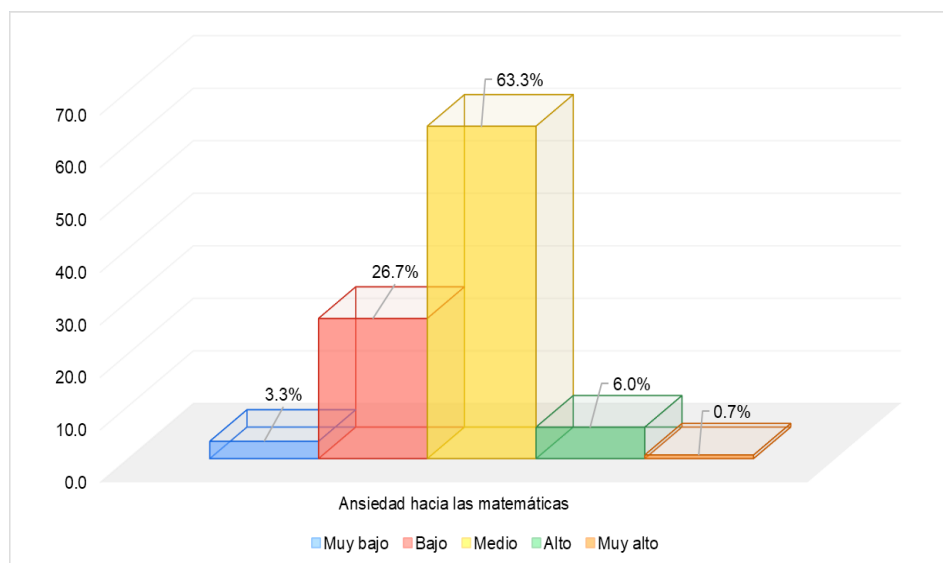
Data collection was carried out after obtaining the necessary authorizations from the competent educational authorities. In order to guarantee student participation, it was decided to carry out the survey in person at the educational institution. The students were cordially invited to participate, and were given detailed instructions for completing the data collection instrument. This process lasted approximately 20 minutes, during which time adequate attention and follow-up were ensured to guarantee the quality of the responses obtained.

To carry out the data analysis, SPSS version 25 software was used. Initially, an exploratory analysis of the variables and dimensions was carried out, focusing on calculating their percentage distributions. Subsequently, we proceeded to a detailed analysis of the items that make up this variable, examining their behavior specifically.

The research was carried out in strict compliance with established ethical standards. Informed consent was obtained from the parents, who were duly informed about the purpose and procedures of the study, as well as about their children's rights of participation and confidentiality. In addition, data confidentiality was preserved by using identification codes instead of personal information. Finally, the principles of the Declaration of Helsinki were respected to safeguard the well-being and integrity of the participants.

## RESULTS

Figure 1 shows that 63,3 % of the students had a medium level of MA, while 26,7 % presented a low level, 6 % a high level, 3,3 % a shallow level, and 0,7 % a very high level. These results indicate that most students occasionally experience worry, nervousness, or tension when facing situations related to mathematics in the classroom.



**Figure 1.** Percentage distribution of the mathematics anxiety variable

Figure 2 shows that 40,7 % of the students rated their attitudes toward mathematics at a medium level, 38 % at a high level, 13,3 % at a low level, 7,3 % at a very high level, and 0,7 % at a shallow level. Regarding emotions, 46 % of the students rated them at a medium level, 24,7 % at a low level, 18,7 % at a high level, 6 % at a very high level, and 4,7 % at a shallow level. Regarding the beliefs dimension, 47,3 % of the students rated them at a medium level, 22 % at a low level, 22 % at a high level, 5,3 % at a very high level, and 3,3 % at a shallow level.

Overall, the findings suggest that there is a diversity of perceptions and experiences among students in relation to mathematics. Although a considerable portion shows a moderate attitude and beliefs towards the subject, there is a significant number who demonstrate a high level of appreciation and confidence in their mathematical abilities.

Table 1 presents the responses to the items related to the attitude dimension. Items 1, 2, and 3 stand out, showing that approximately half of the students constantly or almost always evaluate positively their effort to understand mathematics, express a desire to improve their cognitive skills in this area, and apply strategies such as linking new ideas with previous knowledge during the study of mathematics.

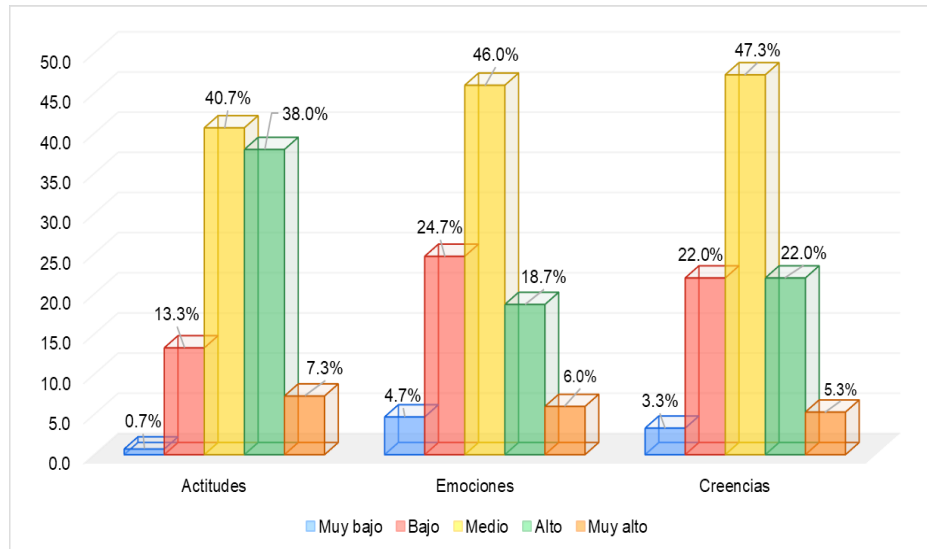


Figure 2. Percentage distribution of the dimension's attitudes, emotions and beliefs

Table 1. Responses to the items corresponding to the attitudes dimension

Items	Never	Almost never	Sometimes	Almost always	Always
1. I value what I get out of the effort to understand mathematics.	2,7	7,3	31,3	31,3	27,3
2. When I study mathematics I try to link new ideas with the knowledge I already have.	0,0	10,0	44,7	32,7	12,7
3. I am attracted to improve my cognitive abilities to understand mathematics.	1,3	11,3	36,7	34,0	16,7
4. I can be completely focused when solving math problems.	2,7	15,3	37,3	30,0	14,7
5. I find it useful to assess my understanding when trying to solve exercises and problems.	4,7	12,0	40,7	26,7	16,0
6. I like to insist until I solve a mathematical problem.	4,0	13,3	37,3	30,7	14,7
7. Math is a subject in which I like to invest time to solve problems.	6,7	26,0	32,7	24,7	10,0
8. I have the patience to solve math problems.	11,3	16,7	36,7	22,0	13,3

Table 2 shows the responses to the items that address the dimension of emotions. It is relevant to point out items 9, 10 and 11, where about one third of the students indicated feeling always or almost always nervous when having to learn mathematics, experiencing frustration when investing a lot of time in solving mathematical problems and worrying about learning new topics in mathematics.

Table 2. Responses to the items corresponding to the emotions dimension

Items	Never	Almost never	Sometimes	Almost always	Always
9. The thought of having to learn math makes me nervous.	11,3	18,0	36,7	22,0	12,0
10. It frustrates me to spend a lot of time working on a math problem.	13,3	22,7	30,7	23,3	10,0
11. I am concerned about learning new topics in mathematics.	12,0	20,0	37,3	20,0	10,7
12. No matter how much I study, mathematics is always difficult for me.	19,3	22,7	31,3	13,3	13,3
13. When solving mathematical problems any obstacle makes me give up.	12,7	24,0	46,0	10,0	7,3
14. I usually solve a math problem that seems too difficult or too long.	6,7	22,7	42,0	19,3	9,3

Table 3 details the responses to the items related to the beliefs dimension. It is essential to highlight items 15, 19, and 20, where about one-third of the students indicated that they always or almost always believe that they can obtain good results in mathematics, enjoy studying this subject, and consider mathematics to be their strong point.

**Table 3.** Responses to the items corresponding to the beliefs dimension

Items	Never	Almost never	Sometimes	Almost always	Always
15. I can do well in mathematics.	4,7	11,3	48,0	25,3	10,7
16. I am naturally good at math.	10,7	20,7	42,0	18,7	8,0
17. Math makes me more nervous than other areas	13,3	21,3	33,3	22,0	10,0
18. I am confident in my math skills.	8,0	20,0	42,0	16,7	13,3
19. Mathematics is a subject I like to study.	10,7	24,7	30,7	20,7	13,3
20. Mathematics is my strong point.	10,7	24,0	30,0	24,0	11,3

## DISCUSSION

The main result of this research reveals that 63,3 % of the students experienced a medium level of MA. In comparison, 26,7 % showed low anxiety, 6 % presented a high level, 3,3 % indicated very low anxiety, and 0,7 % reported a very high level. This picture suggests that most students occasionally face a variety of negative emotions when dealing with mathematics, which could have a significant impact on their ability to learn and perform in this subject.

Similar results were obtained in a research conducted in Mexico<sup>(19)</sup> in which they determined the presence of MA in high school students with adequate academic performance while observing how anxiety symptoms, such as frustration and cognitive blocks, impacted their ability to learn and perform in the subject of mathematics. Similarly, it is related to research developed in Bolivia,<sup>(20)</sup> where they found that mathematics anxiety was at a moderate level among secondary school students. In addition, they highlight a gender disparity, with males exhibiting higher levels of test anxiety than females.

The worry, nervousness, and tension experienced by students reflect an emotional barrier that may hinder their performance and affect their self-confidence.<sup>(21)</sup> These emotions are not only limited to solving mathematical problems but may also have a broader impact on their perception of themselves as capable and competent students.<sup>(22)</sup> Therefore, it is critical to consider both the emotional and cognitive aspects of math anxiety to improve academic performance and promote a more favorable educational environment for students.<sup>(23)</sup>

A relevant finding reveals that the dimensions of attitudes, emotions, and beliefs toward mathematics were rated at a medium level. This result suggests a combination of both positive and negative attitudes and emotions, as well as varied beliefs about the usefulness and difficulty of mathematics. That is, while some students show willingness and confidence in approaching mathematical concepts, others experience anxiety, uncertainty, or lack of interest in certain aspects of the discipline. Similar results were obtained in research conducted in Peru<sup>(18)</sup>, where it was found that attitudes, emotions, and beliefs toward mathematics were at a moderate level.

MA is a complex problem that impacts both academic performance and the emotional well-being of students.<sup>(24)</sup> This challenge originates not only in the classroom but also in personal and social factors that influence students' perception of their mathematical abilities.<sup>(25)</sup> Addressing this anxiety requires a holistic approach that combines effective pedagogical strategies with a school environment that fosters trust and emotional support. Doing so will promote not only students' academic success but also their holistic development as individuals capable of facing challenges with confidence and determination.

The present research is not without limitations, which could influence the interpretation of the results. The sample was small and homogeneous, which could affect the representativeness of the findings. In addition, the use of a self-administered instrument may generate social desirability biases. For future research, it is suggested to conduct multicenter studies that include educational institutions of different types and contexts to obtain a more diverse sample. In addition, complementing quantitative data collection with qualitative methods could provide a deeper understanding of the topic.

## CONCLUSIONS

It was concluded that the level of MA experienced by the majority of Peruvian regular elementary school students was medium. In addition, the dimensions of attitudes, emotions, and beliefs toward mathematics were also rated at a medium level. This means that most students occasionally feel worry, nervousness, or tension when facing mathematics-related situations in the classroom. Therefore, it is suggested that teachers



adopt didactic strategies that foster students' confidence and self-efficacy, such as collaborative activities and adapting teaching methods to suit different learning styles. In addition, teachers must receive ongoing training in techniques to address anxiety and promote emotional well-being in the classroom, which will enable them to provide a more effective and favorable learning environment for all students.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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