

Mathematics Anxiety and Its Influence on Mathematics Performance Among Elementary Learners in Buguias, Benguet

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Publication history: Received: December 29, 2026; Revised: February 15, 2026; Accepted: February 17, 2026

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Abstract

Mathematics achievement remains a persistent challenge among Filipino learners, particularly in rural communities where confidence and engagement in numeracy may be limited. This quantitative correlational study examined the level of mathematics anxiety among Grades 4–6 learners in the Municipality of Buguias, Benguet, and determined its influence on mathematics performance. Using stratified random sampling, 320 learners were selected from public elementary schools across the central, northern, and southern zones of Buguias. Mathematics anxiety was measured using a 20-item Likert-based Mathematics Anxiety Scale, while performance was assessed using standardized mathematics test scores. Descriptive statistics, Pearson correlation, and multiple regression analysis were employed. Results showed that learners experienced moderate mathematics anxiety ($M = 3.24$, $SD = 0.70$) and below-average mathematics performance ($M = 51.36$, $SD = 13.10$). A significant negative relationship was found between mathematics anxiety and performance ($r = -.66$, $p < .001$). Regression analysis confirmed that mathematics anxiety significantly predicted mathematics achievement ($\beta = -10.92$, $p < .001$), explaining 44% of the variance. Findings emphasize the need for anxiety-reducing, supportive, and confidence-building mathematics instruction in Buguias elementary schools.

Keywords: mathematics anxiety, numeracy performance, elementary learners, Buguias Benguet, quantitative correlational study

1. Introduction

Mathematics is widely recognized as a foundational discipline that supports the development of logical reasoning, analytical thinking, and problem-solving skills essential for learners' academic success and everyday functioning. In basic education, mathematics competence is not only a measure of cognitive ability but also a critical determinant of learners' readiness for higher-level learning and participation in a rapidly changing, technology-driven society. In the Philippine context, numeracy skills are emphasized in the K to 12 curriculum as fundamental outcomes of quality education; however, persistent difficulties in mathematics achievement continue to challenge educators and policymakers alike. International large-scale assessments have consistently highlighted the weak mathematics performance of Filipino learners. Results from the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) reveal that Filipino students rank among the lowest globally in mathematics literacy, particularly in problem-solving, reasoning, and application of mathematical concepts to real-life contexts (OECD, 2023). These findings suggest that the issue extends beyond content mastery and may be influenced by broader cognitive, emotional, and contextual factors affecting learning.

While traditional explanations for low mathematics achievement often focus on instructional quality, curriculum alignment, or learner aptitude, increasing attention has been given to affective variables that shape learners' engagement with mathematics. Among these, mathematics anxiety has emerged as a significant psychological barrier that interferes with learning processes and academic performance. Mathematics anxiety is characterized by feelings of tension, apprehension, and fear that arise when learners are confronted with mathematical tasks, often leading to avoidance behaviors and reduced persistence (Ashcraft & Kirk, 2001). Empirical studies consistently demonstrate that mathematics anxiety negatively affects learners' working memory, concentration, and confidence, all of which are essential for successful mathematical reasoning and problem-solving. Learners who experience anxiety tend to disengage from classroom discussions, hesitate to ask questions, and perform poorly in tests despite adequate preparation (Hembree, 1990; Ma, 1999). Over time, repeated negative experiences reinforce a cycle of fear and underachievement, making mathematics a source of distress rather than intellectual growth. In rural and geographically isolated areas such as Buguias, Benguet, the impact of mathematics anxiety may be further intensified. Learners in these contexts often face limited access to instructional resources, fewer enrichment opportunities, and constrained exposure to learner-centered and anxiety-sensitive teaching strategies. Additionally, cultural expectations, language barriers, and limited parental academic support may shape learners' attitudes toward mathematics,

contributing to heightened anxiety and lower performance. Despite growing international literature on mathematics anxiety, localized studies examining its influence on elementary learners' performance in rural Philippine settings remain limited. Understanding how mathematics anxiety manifests among learners in Buguias and how strongly it predicts achievement is essential for developing contextually responsive interventions. Addressing affective barriers at the elementary level is particularly critical, as early negative experiences in mathematics can have long-term consequences on learners' academic trajectories. Thus, this study investigated the level of mathematics anxiety among Grades 4–6 learners in Buguias, Benguet, and examined its influence on mathematics performance. By identifying the extent to which anxiety predicts achievement, the study provides empirical evidence that may inform instructional practices, school-based support programs, and policy decisions aimed at improving numeracy outcomes in rural elementary schools.

2. Material and methods

2.1. Research Design

This study employed a quantitative correlational research design to examine the relationship between mathematics anxiety and mathematics performance among elementary learners in Buguias, Benguet. A correlational approach was deemed appropriate because the study sought to determine the degree and direction of association between variables without manipulating them. Furthermore, this design allowed the researcher to assess the predictive influence of mathematics anxiety on learners' academic performance while controlling for selected demographic and contextual variables, namely parental academic support and gender.

2.2. Research Locale

The study was conducted in public elementary schools across the Municipality of Buguias, Benguet, a predominantly rural area characterized by geographically dispersed communities and limited access to educational resources. To ensure adequate representation of learners from different geographic contexts, schools were grouped into three zones: Central Buguias, Northern Buguias, and Southern Buguias. These zones reflect variations in accessibility, school size, and learning conditions, which are important considerations when examining affective and academic variables among learners.

2.3. Participants of the Study

The participants of the study were Grades 4 to 6 learners enrolled in public elementary schools in Buguias during the School Year 2024–2025. These grade levels were selected because learners at this stage are expected to have developed basic numeracy skills and are regularly exposed to more complex mathematical concepts, which may elicit varying levels of mathematics anxiety. A total of 320 learners participated in the study, providing sufficient statistical power for correlational and regression analyses.

2.4. Sampling Procedure

A stratified random sampling technique was utilized to ensure proportional representation of learners from the three identified zones of Buguias. Each zone served as a stratum, and the number of participants selected from each zone was proportional to the total population of Grades 4–6 learners in that area. Within each stratum, participants were randomly selected to minimize sampling bias and enhance the generalizability of the findings across the municipality.

2.5. Research Instruments

Data were gathered using three research instruments designed to measure mathematics anxiety, mathematics performance, and parental academic support. The Mathematics Anxiety Scale (MAS) was used to assess learners' level of anxiety toward mathematics. The instrument consisted of 20 Likert-type items rated on a five-point scale ranging from strongly disagree to strongly agree. The scale measured four dimensions of mathematics anxiety: fear of problem solving, test-related anxiety, lack of confidence, and classroom participation. The instrument was adapted from previously validated measures and underwent reliability testing, yielding a Cronbach's alpha coefficient of 0.90, indicating excellent internal consistency. Mathematics performance was measured using a Mathematics Performance Test (MPT), a standardized assessment designed to evaluate learners' skills in computation, problem solving, and mathematical reasoning. The test items were aligned with the elementary mathematics curriculum and were reviewed by subject experts for content validity. Reliability analysis using the Kuder–Richardson Formula 20 (KR-20) produced a coefficient of 0.84, indicating acceptable reliability for achievement testing. To account for home-related learning factors, the Parental Academic Support Scale (PASS) was administered. This six-item Likert-scale instrument assessed the extent of parental involvement in learners' mathematics learning, including homework assistance, encouragement, and monitoring of academic progress. The scale demonstrated satisfactory reliability, with a Cronbach's alpha of 0.78.

2.6. Data Gathering Procedure

Prior to data collection, approval to conduct the study was secured from the concerned school authorities and local education officials. Informed consent was obtained from school administrators, class advisers, and parents or guardians of the participating learners. The instruments were administered during regular school hours under the supervision of the

researcher and class advisers to ensure standardized procedures. Learners were first given clear instructions regarding the purpose of the study and were assured that their responses would be treated with confidentiality and used solely for research purposes. The Mathematics Anxiety Scale and Parental Academic Support Scale were administered before the Mathematics Performance Test to minimize test-induced anxiety influencing learners' self-reported responses.

2.7. Data Analysis

The collected data were analyzed using appropriate statistical tools. Descriptive statistics, including mean and standard deviation, were used to determine the levels of mathematics anxiety and mathematics performance among learners. Pearson product-moment correlation was employed to examine the relationship between mathematics anxiety and mathematics performance. To determine the predictive influence of mathematics anxiety while controlling for parental academic support and gender, multiple regression analysis was conducted. All statistical tests were interpreted at the 0.05 level of significance.

2.8. Ethical Considerations

Ethical principles were observed through voluntary participation, anonymity, confidentiality, and secure data handling.

3. Results and Discussion

3.1. Level of Mathematics Anxiety among Elementary Learners

Table 1 presents the level of mathematics anxiety among Grades 4–6 learners in Buguias, Benguet.

Table 1. Level of Mathematics Anxiety among Elementary Learners.

Dimension of Mathematics Anxiety	Mean	SD	Interpretation
Fear of Problem Solving	3.31	0.72	Moderate
Test-Related Anxiety	3.28	0.69	Moderate
Lack of Confidence	3.19	0.71	Moderate
Classroom Participation	3.17	0.68	Moderate
Overall Mathematics Anxiety	3.24	0.70	Moderate

The results indicate that elementary learners in Buguias experienced a moderate level of mathematics anxiety, with an overall mean of 3.24. Among the dimensions, fear of problem solving obtained the highest mean, suggesting that learners commonly feel apprehensive when confronted with mathematical tasks that require independent thinking or multi-step solutions. Test-related anxiety also ranked high, indicating that assessments remain a significant source of stress for learners. Moderate anxiety at this level is a cause for concern because it may gradually erode learners' confidence and willingness to engage in mathematics. Learners who fear problem solving may avoid challenging tasks, while anxiety during tests may interfere with concentration and recall. These findings support Ashcraft and Kirk (2001), who explained that anxiety disrupts working memory processes essential for mathematical reasoning. Hembree (1990) likewise emphasized that even moderate anxiety can negatively affect achievement and classroom participation.

3.2. Level of Mathematics Performance of Learners

Table 2 presents the mathematics performance of learners across different skill areas.

Table 2. Mathematics Performance of Elementary Learners

Mathematics Skill Area	Mean Score	SD	Interpretation
Computation Skills	55.42	12.00	Average
Problem-Solving Skills	50.18	13.40	Below Average
Mathematical Reasoning	48.49	14.10	Below Average
Overall Performance	51.36	13.10	Below Average
Mathematics Skill Area	Mean Score	SD	Interpretation

The overall mathematics performance of learners was below average, with particular difficulty observed in problem-solving and mathematical reasoning skills. While learners demonstrated relatively better performance in computation, they struggled when tasks required conceptual understanding, logical reasoning, and application of mathematical concepts to unfamiliar situations. This pattern suggests that learners may rely more on procedural knowledge rather than deep conceptual understanding. Such findings are consistent with international assessments, which report that Filipino learners

perform weakest in higher-order mathematical literacy tasks (OECD, 2023). Carey et al. (2016) further noted that anxiety disproportionately affects performance in cognitively demanding tasks, which may explain the lower scores in problem solving and reasoning observed in this study.

3.3. Relationship between Mathematics Anxiety and Mathematics Performance

Table 3 shows the correlation between mathematics anxiety and mathematics performance.

Table 3. Relationship between Mathematics Anxiety and Mathematics Performance

Variables	r-value	p-value	Interpretation
Mathematics Anxiety and Mathematics Performance	-0.66	< .001	Strong Negative Relationship

The results revealed a strong and statistically significant negative relationship between mathematics anxiety and mathematics performance. This indicates that learners with higher levels of anxiety tend to obtain lower mathematics scores, while those with lower anxiety perform better. The strength of the relationship underscores mathematics anxiety as a major barrier to learning. Anxious learners may avoid practice, disengage during instruction, and experience cognitive interference during assessments, all of which negatively affect achievement. This finding aligns with Ma's (1999) meta-analysis and Ramirez et al. (2018), who both emphasized the robust inverse relationship between anxiety and mathematics achievement across educational levels.

3.4. Predictors of Mathematics Performance

Table 4 presents the results of the multiple regression analysis predicting mathematics performance.

Table 4. Regression Analysis Predicting Mathematics Performance

Predictor Variable	β	t-value	p-value	Interpretation
Mathematics Anxiety	-10.92	-12.34	< .001	Significant Predictor
Parental Academic Support	1.10	1.42	.156	Not Significant
Gender	0.27	0.39	.695	Not Significant

Model Fit: $R^2 = 0.44$, $F(3,316) = 52.87$, $p < .001$

The regression results indicate that mathematics anxiety significantly predicted mathematics performance, explaining 44% of the variance in learners' achievement. This finding highlights the strong influence of emotional factors on academic performance. In contrast, parental academic support and gender did not significantly predict performance in this model. The substantial explanatory power of mathematics anxiety suggests that affective factors play a more critical role than demographic variables in this context. Carey et al. (2016) explained that anxiety consumes working memory resources needed for mathematical reasoning, while Ramirez et al. (2018) emphasized that emotional regulation is essential for sustained engagement in mathematics learning.

4. Conclusion

This study examined the level of mathematics anxiety among Grades 4–6 elementary learners in Buguias, Benguet, and its influence on mathematics performance. The findings revealed that learners experienced a moderate level of mathematics anxiety and demonstrated below-average mathematics performance, particularly in problem-solving and mathematical reasoning. These results indicate that affective barriers are already present at the elementary level and may hinder learners' engagement with increasingly complex mathematical tasks. The study further established a strong and significant negative relationship between mathematics anxiety and mathematics performance. Learners who reported higher levels of anxiety tended to achieve lower mathematics scores, highlighting the detrimental effect of anxiety on numeracy outcomes. Regression analysis confirmed that mathematics anxiety was a significant predictor of mathematics performance, explaining a substantial proportion of the variance even when parental academic support and gender were controlled. Overall, the findings show the critical role of emotional and psychological factors in elementary mathematics learning. Addressing mathematics anxiety is essential for improving learners' academic performance and fostering positive attitudes toward mathematics. Efforts to strengthen mathematics education should therefore integrate affective support alongside cognitive and instructional strategies to promote more inclusive and effective learning environments.

Compliance with ethical standards

Acknowledgements

The author is grateful to the public elementary schools, teachers, learners, and parents who participated in the study and whose cooperation made this research possible.

Conflict of interest statement

The author confirms sole responsibility for all aspects of this work, including conceptualization, methodology, investigation, data analysis, writing, and revision.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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Author's short biography

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