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Mathematics Anxiety Regulation and Conceptual Understanding Among Grade 7 Learners

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ABSTRACT

Persistent concerns over learners' mathematical understanding have increasingly drawn attention to the role of affective regulation in classroom learning. Situated within this context, the present study investigated the relationship between mathematics anxiety regulation and conceptual understanding among Grade 7 learners in Dappat Integrated School, City of Ilagan, Isabela. A descriptive correlational design with predictive analysis was employed to examine mathematics anxiety regulation in terms of emotional control, confidence in handling difficult mathematical situations, and persistence in sustaining attention despite tension or worry, alongside conceptual understanding in terms of comprehension of mathematical ideas, recognition of relationships among concepts, interpretation of mathematical representations, and ability to explain mathematical reasoning. Data were collected using a validated researcher adapted questionnaire with high internal consistency. Findings showed that the learners demonstrated high levels of mathematics anxiety regulation and conceptual understanding. Multiple regression analysis further revealed that mathematics anxiety regulation significantly predicted conceptual understanding, with emotional control emerging as the strongest predictor, followed by persistence and confidence. The model accounted for a substantial proportion of the variance in conceptual understanding, indicating that learners' capacity to regulate anxiety meaningfully contributed to deeper mathematical comprehension. These findings highlight the pedagogical value of fostering emotionally supportive mathematics classrooms that promote both regulation and understanding.

Keywords: *mathematics anxiety regulation, conceptual understanding, Grade 7 learners, emotional control, predictive analysis, Mathematics learning*

INTRODUCTION

Mathematics learning in the early years of secondary school often marks a turning point in how learners see themselves as thinkers, problem solvers, and participants in classroom life. For many Grade 7 learners, Mathematics is no longer limited to simple recall or basic computation. It begins to require abstraction, symbolic reasoning, pattern recognition, and the ability to explain why a solution works. At this stage, learners are expected not only to perform procedures but also to build conceptual understanding, which refers to a connected and meaningful grasp of mathematical ideas. The National Council of Teachers of Mathematics emphasized that conceptual understanding is central to mathematical proficiency because learners need to make sense of relationships, representations, and underlying structures rather than rely only on memorized steps (National Council of Teachers of Mathematics [NCTM], 2023). In the same direction, contemporary studies in mathematics education continue to show that deep understanding develops when

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learners construct knowledge, recognize relationships among ideas, and use these ideas flexibly in new situations (Kusmaryono et al., 2021; Toxtle-Colotl et al., 2025).

Yet the development of conceptual understanding does not occur in a purely cognitive space. It is deeply influenced by learners' emotions, beliefs, and classroom experiences. One of the most persistent affective barriers in mathematics is mathematics anxiety, which has been described as feelings of tension, worry, dread, and mental uneasiness that arise when individuals engage with numbers, mathematical tasks, or anticipated mathematics situations. Over the past decade, research has consistently shown that mathematics anxiety is negatively associated with mathematics learning and performance. A major meta-analysis by Namkung et al. (2019) found a significant negative relationship between mathematics anxiety and mathematics performance among school aged learners. This pattern was reinforced by Barroso et al. (2021), whose meta-analysis also reported a statistically significant negative correlation between math anxiety and achievement. More recently, Lau et al. (2024) described the connection between math anxiety and achievement as robust, noting that anxiety can interfere with learning through cognitive disruption and avoidance. These findings suggest that when learners are overwhelmed by fear or tension, their capacity to process mathematical ideas meaningfully may also be weakened.

The concern becomes even more relevant in educational systems where mathematics achievement remains a continuing challenge. In the Philippines, results from PISA 2022 showed that 15-year-old learners performed far below the OECD average in mathematics, highlighting the urgency of strengthening both the cognitive and affective foundations of mathematics learning (OECD, 2023, 2025). While large scale assessments do not reduce low performance to a single cause, OECD reports have repeatedly shown that mathematics anxiety is associated with lower mathematics scores and that supportive classroom conditions, including formative instructional practices, are linked with lower levels of anxiety (OECD, 2015, 2023). These realities make the school level investigation of mathematics anxiety especially important, particularly in public school contexts where learners may be navigating academic adjustment, varied prior knowledge, and increasing curricular demands. For Grade 7 learners in Dappat Integrated School in the City of Ilagan, Isabela, examining how mathematics anxiety is regulated and how such regulation relates to conceptual understanding may provide a clearer picture of learners' actual mathematical experience.

The idea of mathematics anxiety regulation is important because not all anxious learners respond to mathematics in the same way. Some become avoidant, passive, and mentally blocked, while others gradually learn to manage their emotions, remain engaged, and continue thinking through difficult tasks. Recent literature has pointed to the educational value of helping learners regulate mathematics related anxiety rather than treating anxiety as a fixed trait. Balt et al. (2022), in a systematic review of intervention research, concluded that school-based efforts can reduce mathematics anxiety, although the effectiveness of interventions depends on how they are implemented and matched to learners' needs. OECD findings have also suggested that classroom practices can shape students' emotional experiences in mathematics, indicating that anxiety is not merely a personal issue but also an instructional concern (OECD, 2015). This means that studying mathematics anxiety regulation among Grade 7 learners is not only about identifying fear. It is about understanding how learners cope with mathematical tension, how they remain cognitively engaged, and whether emotional regulation supports stronger conceptual learning.

This study was anchored on the view that meaningful mathematics learning requires the healthy interaction of cognition and emotion. Conceptual understanding cannot fully develop when learners are mentally preoccupied with fear, confusion, or self-doubt, especially in lessons that require explanation, connection making, and flexible reasoning. At the same time, a learner who can regulate anxiety may be more capable of sustaining attention, organizing thought, and making sense of mathematical concepts. Despite the growing body of international literature on math anxiety and achievement, there remains a need for localized school-based inquiry that focuses specifically on junior high school learners and on conceptual understanding rather than test scores alone. In the framework of Dappat Integrated School in the City of Ilagan, Isabela, this study sought to determine whether learners' ability to regulate mathematics anxiety was

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associated with their level of conceptual understanding. Its results may serve as a basis for more responsive mathematics teaching practices, learner support strategies, and classroom interventions that strengthen both emotional readiness and conceptual depth in Mathematics.

Literature Review

Conceptual Understanding in Mathematics

Conceptual understanding is widely regarded as a foundational goal of mathematics education because it allows learners to see relationships among ideas, explain why procedures work, and apply knowledge flexibly in unfamiliar situations. The National Council of Teachers of Mathematics emphasized that conceptual understanding should develop alongside procedural fluency, since students who merely memorize steps often struggle to transfer learning to new problems (National Council of Teachers of Mathematics [NCTM], 2023). In the middle grades, this becomes especially important because learners begin to encounter more abstract content that requires reasoning, representation, and explanation rather than simple recall. Smith et al. (2018) also explained that conceptual understanding grows when instruction gives students opportunities to explore ideas, discuss strategies, and connect mathematical representations in meaningful ways.

In a study of secondary school students, Toxtle-Colotl et al. (2025) found that conceptual understanding of integer operations could be examined through skills, properties, uses, and representations, with students showing uneven performance across these dimensions. Their findings suggest that a learner may perform adequately on routine tasks yet still have fragile understanding when asked to interpret representations or justify mathematical relationships.

Mathematics Anxiety as an Affective Barrier to Learning

Mathematics anxiety has been consistently identified as one of the most important affective barriers to mathematics learning. It refers to feelings of tension, worry, fear, and uneasiness that arise when learners engage in mathematical tasks or even anticipate such tasks. Large scale evidence has shown that this is not a minor classroom issue. Namkung et al. (2019), in a meta-analysis of 131 studies involving school aged learners, found a significant negative relationship between mathematics anxiety and mathematics performance. This pattern was reinforced by Barroso et al. (2021), who reported a small to moderate but statistically significant negative correlation between math anxiety and math achievement. Lau et al. (2024) likewise described the association between math anxiety and achievement as robust and explained that anxiety may interfere with mathematical success through multiple pathways rather than through emotion alone.

These findings matter because mathematics anxiety can influence not only how well learners perform on tests but also how they engage with lessons, tasks, and classroom participation. Song et al. (2023) found that higher math anxiety was associated with lower achievement and that this link was partly explained by negative homework behaviors and reduced participation in math related extracurricular activities. In a related study, Quintero et al. (2022) found that students with higher math anxiety showed lower cognitive behavioral and emotional engagement in mathematics learning contexts. Together, these studies suggest that mathematics anxiety may gradually weaken the learning process by discouraging active engagement, persistence, and confidence.

Mathematics Anxiety Regulation and Emotional Control in Learning

Although mathematics anxiety is often discussed as a problem, recent literature has shifted attention toward how learners regulate or manage anxious feelings while learning mathematics. This perspective is important because students do not respond to anxiety in identical ways. Some disengage immediately, while others use emotional or cognitive strategies that allow them to continue participating in mathematical

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activity. Skagerlund et al. (2025) examined mathematics anxiety alongside emotion regulation and showed that these constructs are meaningfully connected, supporting the view that learners' emotional control processes are relevant to how they experience mathematics. Their work strengthens the idea that mathematics anxiety should not be treated only as a fixed emotional state, but also as something shaped by learners' regulatory capacities.

A recent systematic review by Harahap et al. (2025) also supports the importance of regulation related strategies. Reviewing 28 studies through a PRISMA guided process, the authors found that stronger self-regulated learning was generally associated with lower mathematics anxiety, while lower self-regulation tended to accompany higher anxiety. The review also emphasized the value of metacognitive strategies in improving students' learning experiences and reducing mathematics anxiety.

The Cognitive Mechanisms Linking Anxiety and Understanding

The relationship between mathematics anxiety and learning is not merely emotional. It is also cognitive. Lau et al. (2024) explained that two major perspectives help account for this relationship: one perspective argues that weak performance can trigger anxiety, while another argues that anxiety itself undermines performance by consuming mental resources. This latter explanation is often connected to processing efficiency and attentional control, where anxious thoughts compete with task related thinking. When learners become preoccupied with fear of failure, embarrassment, or confusion, fewer cognitive resources remain available for reasoning, interpretation, and conceptual processing.

Related work supports this cognitive interference view. Demedts et al. (2022) found that state and trait mathematics anxiety were meaningfully related to mathematics performance and that the relationship varied by task conditions, suggesting that anxious reactions are especially relevant during active mathematical processing. Work summarized in recent reviews has also linked mathematics anxiety with working memory demands, indicating that anxious learners may struggle more when tasks require sustained mental manipulation or flexible thinking.

Classroom Experiences, Engagement, and the Development of Understanding

The literature suggests that classroom experiences strongly shape both mathematics anxiety and conceptual learning. Conceptual understanding is more likely to develop in classrooms where learners are encouraged to explore ideas, justify thinking, compare strategies, and engage with multiple representations. Smith et al. (2018) argued that teaching for conceptual understanding requires classrooms that position students as sense makers rather than passive receivers of procedures. In the same spirit, the NCTM (2023) stressed that meaningful mathematics instruction should help learners build conceptual foundations before and during procedural work. Such instruction can support deeper understanding and may also reduce the fear that often comes from rote and high-pressure mathematics experiences.

Empirical studies also show that engagement behaviors matter in the anxiety achievement connection. Quintero et al. (2022) found that students with higher mathematics anxiety demonstrated less classroom engagement, while Song et al. (2023) showed that behaviors outside the classroom, such as homework patterns and extracurricular involvement, also helped explain the link between anxiety and achievement. These findings imply that the classroom is not simply a place where anxiety is observed. It is also where anxiety may either be reinforced or reduced through task design, teacher support, and opportunities for successful participation.

International and Philippine Context of Mathematics Learning

International evidence further highlights the importance of examining mathematics anxiety in school settings. OECD data from PISA 2022 showed that mathematics anxiety was negatively associated with mathematics achievement in every participating education system with available data. On average across OECD countries, a one-point increase in the mathematics anxiety index was associated with a

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decrease of 18 score points in mathematics after accounting for socioeconomic profile. OECD also reported that students with a growth mindset tended to report less mathematics anxiety than those with a fixed mindset. These findings indicate that mathematics anxiety is both widespread and educationally consequential.

In the Philippines, the concern becomes even more pressing. According to OECD Education GPS based on PISA 2022, 15-year-old learners in the Philippines obtained an average mathematics score of 355, compared with the OECD average of 472. While many factors contribute to national learning outcomes, this result underscores the need to investigate school-based influences on mathematics learning, including learners' emotional readiness and conceptual development.

METHODS

Research Design

This study employed a descriptive correlational research design with predictive analysis. The design was considered appropriate because the study sought to determine the level of mathematics anxiety regulation and the level of conceptual understanding among Grade 7 learners, and to examine whether mathematics anxiety regulation significantly influenced conceptual understanding. Unlike purely experimental approaches that require manipulation of variables, this design allowed the researcher to examine naturally occurring conditions in the actual school setting. It was especially suitable for the present inquiry because the study focused on describing the learners' present condition and determining the extent to which the dimensions of mathematics anxiety regulation could explain variations in their conceptual understanding. To strengthen the analysis, the study did not stop at simple association testing. It also incorporated multiple regression analysis, which provided a more refined examination of how specific dimensions of anxiety regulation contributed to conceptual understanding when considered simultaneously.

Research Locale

The study was conducted at Dappat Integrated School in the City of Ilagan, Isabela. The school served as an appropriate setting for the investigation because it catered to junior high school learners who were undergoing the transition from elementary mathematics to more formal and abstract mathematical content. This stage of learning is often accompanied by increased academic demands, adjustment to higher expectations, and varying emotional responses toward Mathematics. As a public school in the division context of Isabela, Dappat Integrated School provided a realistic educational environment in which the relationship between mathematics anxiety regulation and conceptual understanding could be meaningfully examined. The locale was therefore relevant to the nature of the study because it reflected the everyday classroom context where learners' emotional control and mathematical comprehension interact.

Participants and Sampling Technique

The participants of the study were the Grade 7 learners enrolled at Dappat Integrated School during the period of data collection. The study employed total enumeration, in which all members of the identified population were included as participants. This technique was considered appropriate because the target group was manageable and fully accessible to the researcher, allowing the study to gather data from the entire population rather than from a selected subset. By including all Grade 7 learners, the study was able to capture a completer and more accurate picture of the learners' mathematics anxiety regulation and conceptual understanding within the school context. The use of total enumeration also strengthened the coverage of the study and reduced the possibility of sampling bias, thereby making the findings more reflective of the actual condition of the intended group.

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Research Instrument

The study utilized a researcher adapted survey questionnaire composed of two major parts. The first part measured mathematics anxiety regulation, while the second part assessed conceptual understanding in Mathematics. The mathematics anxiety regulation section was structured around dimensions such as emotional control during mathematical tasks, confidence in handling difficult mathematical situations, and persistence in sustaining attention despite feelings of tension or worry. The conceptual understanding section included indicators focused on comprehension of mathematical ideas, recognition of relationships among concepts, interpretation of mathematical representations, and the ability to explain reasoning.

Before the actual administration, the instrument underwent content validation by experts composed of specialists in educational research and Mathematics instruction. Their comments and recommendations were incorporated to improve the clarity, relevance, and appropriateness of the items. After revision, the instrument was pilot tested among learners who possessed characteristics similar to the target participants but were not included in the actual study. The internal consistency of the questionnaire was determined using Cronbach's alpha. The mathematics anxiety regulation scale obtained an alpha coefficient of 0.91, while the conceptual understanding scale registered an alpha coefficient of 0.89. The overall instrument yielded a Cronbach's alpha of 0.90, indicating high reliability and showing that the items were sufficiently consistent for use in the actual study.

Data Gathering

The researcher first secured the necessary permission from the school authorities before the conduct of the study. After approval was granted, the researcher coordinated with the school head and concerned teachers regarding the schedule and procedure of questionnaire administration. The purpose of the study was explained clearly to the participants, and proper instructions were given before they answered the instrument.

The questionnaires were then distributed personally by the researcher in the designated schedule. Participants were given enough time to read and respond to each item carefully. During the administration, the researcher remained available to clarify directions without influencing the answers of the learners. After all questionnaires had been completed, the responses were collected, checked for completeness, and organized for coding and statistical treatment. The gathered data were then encoded in a statistical software package for analysis.

Data Analysis

The data were analyzed using both descriptive and inferential statistical tools. To determine the level of mathematics anxiety regulation and conceptual understanding, the study used the weighted mean and standard deviation. These measures provided a clear summary of the learners' average responses and the consistency of those responses across indicators.

To test the predictive connection between mathematics anxiety regulation and conceptual understanding, the study employed multiple linear regression analysis. This treatment was selected because it allowed the researcher to determine whether the dimensions of mathematics anxiety regulation significantly explained the learners' conceptual understanding when taken as a set and when examined in terms of their individual contributions. Compared with a simple Pearson correlation, regression analysis offered a more meaningful statistical treatment for the study because it moved beyond mere association and estimated the extent to which the independent variable could account for variation in the dependent variable.

In addition, the study used the coefficient of determination (R^2) to estimate how much variance in conceptual understanding was explained by mathematics anxiety regulation. The F test was used to evaluate the overall significance of the regression model, while the beta coefficients and t tests were used to identify

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which dimensions of mathematics anxiety regulation significantly influenced conceptual understanding. All hypotheses were tested at the 0.05 level of significance.

Ethical Consideration

Ethical standards were carefully observed throughout the conduct of the study. Permission to undertake the research was obtained from the proper school authorities before any data collection was carried out. Participation in the study was entirely voluntary, and no learner was forced or pressured to take part. The participants were informed of the purpose of the study, the nature of their involvement, and their right to decline or withdraw at any stage without penalty.

Confidentiality and anonymity were likewise protected. The questionnaires did not require the participants to write identifying personal information that could expose their identity. All responses were treated with strict confidentiality and were used solely for academic and research purposes. The researcher also ensured that the study caused no physical, psychological, or emotional harm to the participants. The gathered data were stored securely and were handled only by the researcher to preserve their privacy and integrity.

RESULTS AND DISCUSSION

Table 1. Level of Mathematics Anxiety Regulation Among Grade 7 Learners

Indicators of Mathematics Anxiety Regulation	Mean	SD	Descriptive Interpretation
Emotional control during mathematical tasks	3.86	0.58	High
Confidence in handling difficult mathematical situations	3.74	0.62	High
Persistence in sustaining attention despite tension or worry	3.81	0.60	High
Overall Mean	3.80	0.60	High

Legend: 4.21 to 5.00, Very High; 3.41 to 4.20, High; 2.61 to 3.40, Moderate; 1.81 to 2.60, Low; 1.00 to 1.80, Very Low.

The findings show that the Grade 7 learners demonstrated a high level of mathematics anxiety regulation, with an overall mean of 3.80 and a standard deviation of 0.60. Among the indicators, emotional control during mathematical tasks obtained the highest mean of 3.86, suggesting that the learners were generally able to manage nervousness, worry, or pressure while engaging in Mathematics activities. This implies that although anxiety may still be present, the learners had developed a fair degree of emotional steadiness when dealing with mathematical demands.

The indicator persistence in sustaining attention despite tension or worry ranked second with a mean of 3.81, indicating that the learners could continue focusing on mathematical tasks even when they experienced some uneasiness. This is an encouraging result because persistence is an important part of learning Mathematics, especially in tasks that require careful thinking and sustained effort. Meanwhile, confidence in handling difficult mathematical situations obtained the lowest mean of 3.74, although it still fell within the high descriptive range. This suggests that while the learners were fairly confident, this aspect was slightly less developed than their emotional control and persistence. Overall, the results imply that the respondents possessed a relatively healthy capacity to regulate anxiety in Mathematics, which may have helped them remain engaged in learning situations.

Table 2. Level of Conceptual Understanding Among Grade 7 Learners

Indicators of Conceptual Understanding	Mean	SD	Descriptive Interpretation
Comprehension of mathematical ideas	3.79	0.56	High
Recognition of relationships among concepts	3.72	0.59	High
Interpretation of mathematical representations	3.68	0.63	High

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Indicators of Conceptual Understanding	Mean	SD	Descriptive Interpretation
Ability to explain mathematical reasoning	3.76	0.57	High
Overall Mean	3.74	0.59	High

Legend: 4.21 to 5.00, Very High; 3.41 to 4.20, High; 2.61 to 3.40, Moderate; 1.81 to 2.60, Low; 1.00 to 1.80, Very Low.

Table 2 reveals that the learners attained a high level of conceptual understanding in Mathematics, as indicated by the overall mean of 3.74 and standard deviation of 0.59. The highest rated indicator was comprehension of mathematical ideas, with a mean of 3.79, which shows that the learners were generally able to grasp basic mathematical principles and meanings beyond mere memorization. This suggests that they were not simply relying on procedures alone, but were also developing understanding of what mathematical concepts represent.

The ability to explain mathematical reasoning followed closely with a mean of 3.76, indicating that many learners could justify or describe how they arrived at an answer. This is a positive sign because explanation is a strong marker of real understanding in Mathematics. On the other hand, interpretation of mathematical representations registered the lowest mean of 3.68, though still described as high. This may imply that learners found it slightly more challenging to connect symbols, diagrams, expressions, or other forms of representation into a clear mathematical meaning. The result suggests that conceptual understanding was present at a generally favorable level, yet some dimensions, especially those involving representations and conceptual connections, may still need strengthening.

Table 3. Model Summary of the Regression Analysis on Mathematics Anxiety Regulation as Predictor of Conceptual Understanding

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Descriptive Interpretation
1	0.682	0.465	0.451	0.417	Substantial Predictive Relationship

Table 3 shows the regression model summary for mathematics anxiety regulation as a predictor of conceptual understanding. The computed R value of 0.682 indicates a substantial relationship between the set of predictor variables and conceptual understanding. The R^2 value of 0.465 means that 46.5 percent of the variance in conceptual understanding could be explained by the dimensions of mathematics anxiety regulation included in the model. This is a meaningful proportion, suggesting that learners' ability to regulate anxiety had a considerable contribution to how well they understood mathematical concepts.

The adjusted R^2 of 0.451 further confirms that even after accounting for the number of predictors in the model, mathematics anxiety regulation still explained a substantial portion of the variation in conceptual understanding. This result implies that the dependent variable was not shaped by chance alone, but was meaningfully associated with the emotional and self-regulatory capacities of the learners in mathematical situations. At the same time, since more than half of the variance remained unexplained, the findings also suggest that other factors such as teaching strategies, prior knowledge, study habits, and classroom environment may also influence conceptual understanding.

Table 4. ANOVA of the Regression Model

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value	Decision
Regression	18.764	3	6.255	35.981	0.001	Significant
Residual	21.608	124	0.174			
Total	40.372	127				

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Table 4 presents the overall significance of the regression model. The computed F-value of 35.981 with a corresponding p-value of 0.001 indicates that the model was statistically significant at the 0.05 level. This means that the dimensions of mathematics anxiety regulation, when taken together, significantly predicted the conceptual understanding of the Grade 7 learners.

The significance of the model supports the idea that mathematics anxiety regulation was not merely associated with conceptual understanding in a general sense, but actually served as a meaningful explanatory variable in the study. In other words, the learners' capacity to regulate their anxiety in Mathematics was found to be an important factor in understanding why some learners demonstrated stronger conceptual understanding than others. This finding aligns with the study's assumption that emotional regulation plays a central role in allowing learners to think clearly, process concepts meaningfully, and remain cognitively engaged in mathematical tasks.

Table 5. Regression Coefficients on the Influence of Mathematics Anxiety Regulation on Conceptual

Predictors	Unstandardized Beta	SE	Standardized Beta	t-value	p-value	Decision
Constant	1.284	0.239		5.372	0.001	Significant
Emotional control during mathematical tasks	0.291	0.073	0.332	3.986	0.001	Significant
Confidence in handling difficult mathematical situations	0.214	0.081	0.229	2.642	0.009	Significant
Persistence in sustaining attention despite tension or worry	0.267	0.077	0.294	3.468	0.001	Significant

Table 5 shows the individual contribution of each dimension of mathematics anxiety regulation to conceptual understanding. The results reveal that all three predictors significantly influenced conceptual understanding. Among them, emotional control during mathematical tasks emerged as the strongest predictor, with a standardized beta of 0.332, t-value of 3.986, and p-value of 0.001. This indicates that learners who were better able to remain emotionally steady while doing Mathematics tended to show higher conceptual understanding. The finding suggests that emotional calmness may free the learner's mind for deeper thinking, interpretation, and reasoning.

The second strongest predictor was persistence in sustaining attention despite tension or worry, which yielded a standardized beta of 0.294 and a p-value of 0.001. This implies that learners who continued working through mathematical discomfort rather than withdrawing from it were more likely to develop stronger conceptual understanding. This is important because conceptual learning often requires effort, patience, and continued engagement with unfamiliar ideas. Meanwhile, confidence in handling difficult mathematical situations also significantly predicted conceptual understanding, with a standardized beta of 0.229 and p-value of 0.009. Although it had the smallest beta among the three, it still made a meaningful contribution, showing that learners who believed they could face mathematical difficulty were more likely to understand concepts more deeply.

The regression coefficients suggest that mathematics anxiety regulation was not a one-dimensional influence. Rather, it operated through several related but distinct learner capacities, namely emotional control, persistence, and confidence. These dimensions worked together to shape conceptual understanding, but emotional control appeared to be the most influential element in the present study.

CONCLUSION

The Grade 7 learners in Dappat Integrated School demonstrated high mathematics anxiety regulation and high conceptual understanding, indicating that they were generally capable of managing mathematical tension while also showing meaningful comprehension of mathematical ideas, relationships,

representations, and reasoning. The findings further established that mathematics anxiety regulation significantly predicted conceptual understanding, with emotional control during mathematical tasks emerging as the strongest predictor, followed by persistence in sustaining attention despite worry and confidence in handling difficult mathematical situations. This means that learners who were better able to regulate their emotional responses in Mathematics were more likely to achieve deeper conceptual learning. Based on these findings, it is recommended that Mathematics teachers strengthen classroom practices that reduce fear and pressure during lessons, such as supportive questioning, guided practice, encouragement of error friendly participation, and structured opportunities for learners to explain their thinking. Schools may also design learner support activities that enhance confidence, persistence, and emotional regulation in Mathematics, while instructional materials may place greater emphasis on conceptual explanation and interpretation of mathematical representations. In addition, school administrators may encourage professional development activities that equip teachers with strategies for addressing mathematics anxiety in class. Future researchers may further examine other factors associated with conceptual understanding, such as teaching approaches, parental support, study habits, and learner motivation, to build a broader explanation of Mathematics learning among junior high school students.

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