Available online at: http://journal.uinsgd.ac.id/index.php/al aulad
DOI: https://doi.org/10.15575/al-aulad.v9i2.55558
Al Aulad: Journal of Islamic Primary Education, 9 (2), 2026, 120 - 135

p-ISSN: 2615-5605
e-ISSN: 2620-5238

ALLEVIATING MATHEMATICS ANXIETY TO EMPOWER PRIMARY NUMERACY SKILLS: THE INSTRUCTIONAL ROLE OF THE CALM STRATEGY IN MADRASAH IBTIDAIYAH

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Received: Mey, 2026, Accepted: September, 2026, Published: September, 2026

ABSTRACT

Elementary mathematics learning in Madrasah Ibtidaiyah is often impeded by mathematics anxiety, which obstructs cognitive processing during basic arithmetic tasks. This study aims to evaluate the effectiveness of the Controlling Anxiety for Learning Mathematics (CALM) strategy in enhancing the numeracy skills of fifth-grade madrasah students. Utilizing a pre-experimental one-group pretest-posttest design, the investigation involved 20 fifth-grade students from an Islamic elementary school in Semarang Regency, Indonesia, selected through purposive sampling based on low baseline numeracy performance. Data were gathered through validated arithmetic tests and structured classroom observation rubrics, analyzed using descriptive statistics, the Shapiro-Wilk normality test, paired-sample t-test, and normalized gain (N-Gain) analysis via SPSS version 25. The findings revealed a statistically significant increase in students' mean numeracy scores from 30.75 in the pretest to 73.50 in the posttest ($t(19) = 18.42, p < 0.001$, Cohen's $d = 2.85$). The average N-Gain was 0.62, which was classified as moderate. Theoretically, the structured execution of CALM, incorporating relaxation, cognitive restructuring, systematic desensitization, and effective learning strategies, reinforces Social Cognitive Theory and Humanistic Learning Theory, substantiating that emotional stability is a vital prerequisite for elementary numeracy mastery.

Keywords: *CALM Strategy, Madrasah Ibtidaiyah, Mathematics anxiety, Numeracy Skills.*

1. Introduction

Mathematics constitutes a fundamental pillar in the primary education curriculum, systematically fostering students' logical, analytical, critical, and abstract reasoning capacities (Antara et al., 2025; Asmaarobiyah et al., 2025; Jannah et al., 2024). Mastery of fundamental numeracy, encompassing arithmetic operations such as addition, subtraction, multiplication, and division, is not merely an academic milestone, but a critical life skill prerequisite for navigating complex mathematical concepts, science education, and real-world quantitative decision-making (Ardianik & Hadi, 2022; Lusyana & Fahera, 2025).

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Within the Indonesian basic education framework, specifically in Madrasah Ibtidaiyah (MI), cultivating robust mathematical numeracy from an early age is prioritized to build sustainable academic resilience (Mirawati & Raharja, 2022; Rukinah, 2023; Witono & Hadi, 2025). Consequently, achieving computational fluency and conceptual understanding in primary madrasah students serves as an indispensable prerequisite for subsequent cognitive development and national educational benchmarks.

Despite its recognized significance, contemporary literature reveals that elementary mathematics education frequently encounters substantial instructional and psychological hurdles (Szczygieł & Pieronkiewicz, 2022). In the transitional developmental phase of upper elementary school, specifically fifth grade, students are cognitively prompted to transition from concrete operational thinking to abstract algebraic representations and multi-step computational procedures. However, the dual-curriculum demands inherent in Madrasah Ibtidaiyah, which integrate standard national academic subjects with rigorous religious studies, often exacerbate cognitive fatigue and instructional time constraints. Recent empirical surveys indicate that early difficulties in manipulating numerical operations create cascading learning deficits, leading to widespread conceptual alienation and negative attitudes toward STEM-related disciplines if left unaddressed (Antoniou et al., 2026; Cosso et al., 2022).

Preliminary empirical observations conducted at a rural Madrasah Ibtidaiyah in Semarang Regency, Central Java, delineate a profound arithmetic crisis that mirrors these broader national challenges. Preliminary diagnostic evaluation data revealed that the average baseline numeracy score of fifth-grade students reached only 30.75 out of 100, falling dramatically below the standard minimum mastery criteria (Kriteria Ketuntasan Minimal/KKM). This severe deficit was corroborated through in-depth diagnostic interviews with the primary classroom teacher, who reported that students consistently exhibited operational paralysis, frequent calculation errors, and intense reluctance when confronting basic arithmetic tasks. Persistent deficits in elementary numeracy pose detrimental ramifications for students' future academic trajectories, creating severe conceptual roadblocks for advanced curricula and impeding individual functional independence in practical everyday problem-solving (Amanda et al., 2024; Dafrinawati et al., 2023; Nurhaswinda & Parisu, 2025; Sahrunayanti et al., 2023).

A critical diagnostic synthesis of empirical and theoretical literature indicates that students' pervasive numeracy deficits are primarily fueled by affective dysregulation, specifically mathematics anxiety (Cosso et al., 2022; Mangkuwibawa et al., 2024; Saputri et al., 2024). Theoretically, the detrimental link between mathematics anxiety and numeracy skills can be explained through Cognitive Load Theory and Attentional Control Theory. Mathematics anxiety is conceptualized as a debilitating state of emotional tension, apprehension, and fear that disrupts cognitive functioning when an individual manipulates numbers and solves mathematical problems (Nugroho et al., 2023; Wang & Wei, 2025). Under stressful mathematical conditions, acute anxiety overactivates the amygdala and overloads the central executive resources of working memory with intrusive task-irrelevant worries and fear of negative evaluation (Rada & Lucietto, 2022; Rahmawati et al., 2024; Szczygieł & Pieronkiewicz, 2022). Because fundamental numeracy tasks, such as multi-digit division, fraction operations, and multistep arithmetic reasoning, demand active mental manipulation and retrieval from long-term memory, this affective overload directly depletes the cognitive bandwidth required for procedural execution, resulting in calculation freezes and recurring computational blunders. Conventional remedies historically deployed by educators, such as mechanical drill-and-practice routines, remedial homework, and generic

instructional media, routinely fail to resolve this issue because they focus exclusively on procedural repetition while inadvertently exacerbating students' affective distress and evaluation phobia (Aprilia et al., 2024; Nurwiani & Tristanti, 2025).

To dismantle the debilitating cycle of mathematics anxiety, interdisciplinary educational research has underscored the necessity of integrating clinical-psychological interventions directly into pedagogical delivery. Among these, physiological relaxation protocols and cognitive restructuring have emerged as highly potent countermeasures (Barski-Carrow, 2023; Sofiannisa et al., 2025). Somatic relaxation exercises, such as controlled diaphragmatic breathing and progressive muscle relaxation, effectively suppress sympathetic autonomic arousal and lower cortisol-induced stress responses before problem-solving tasks commence (Teklu, 2023). Simultaneously, cognitive restructuring targets maladaptive cognitive schemas, such as catastrophic fear of failure, learned helplessness, and perceived mathematical inadequacy, systematically reframing them into positive, constructive self-efficacy affirmations (Gebauer et al., 2021; Lutfiyah et al., 2025).

Complementing affective stabilization, the systematic desensitization technique and the structured development of effective learning strategies provide procedural mechanisms to restore academic self-regulation (Damayanti, 2026). Systematic desensitization progressively exposes students to numerical challenges across a carefully graduated hierarchical spectrum, progressing from low-threat, foundational arithmetic tasks to increasingly complex problem-solving scenarios, thereby neutralizing conditioned anxiety responses through cumulative, mastery-oriented success experiences (Ion & Popescu, 2025). Furthermore, equipping students with explicit metacognitive learning strategies, error-management frameworks, and structured time-management skills empowers them to navigate computational tasks with operational autonomy and sustained emotional resilience (Antoniou et al., 2026).

The structured amalgamation of these four therapeutic and instructional mechanisms forms the foundation of the Controlling Anxiety for Learning Mathematics (CALM) strategy (Finlayson, 2014; Suinn & Edwards, 1982). Crucially, the CALM strategy in this study is operationalized not as an extracurricular counseling program conducted outside class hours, but as an intact, teacher-facilitated instructional model integrated directly into the phases of mathematics lessons (opening mental readiness, guided arithmetic exploration, and independent problem-solving). The mechanistic pathway of CALM in fostering numeracy skills works through a synchronized four-step progression: (1) relaxation routines at the lesson opening quiet autonomic agitation, thereby liberating working memory capacity from physiological panic; (2) cognitive restructuring reframes negative inner self-talk into constructive mathematical self-efficacy; (3) systematic desensitization scaffolds arithmetic tasks along a graded hierarchy (from concrete single-step computations to abstract word problems) to eliminate fear through repeated micro-successes; and (4) effective learning strategies furnish students with concrete heuristics and procedural algorithms to execute calculations with precision.

Nevertheless, a critical research gap persists in the existing literature: the overwhelming majority of empirical investigations on mathematics anxiety interventions have been conducted within secondary, vocational, or higher education institutions, or have focused strictly on urban general public schools (Wang & Wei, 2025). Empirical inquiries evaluating a teacher-facilitated, real-time CALM intervention embedded within the distinct socio-pedagogical and institutional environment of rural or semi-urban Madrasah Ibtidaiyah remain strikingly scarce, leaving an urgent theoretical and practical void regarding its quantitative efficacy on foundational numeracy gains.

To address this empirical gap, the primary objective of this study is to investigate the effectiveness of the Controlling Anxiety for Learning Mathematics (CALM) strategy in improving the numeracy skills of fifth-grade students at an Islamic elementary school in Semarang Regency. The theoretical justification and novelty of this research lie in the formulation and empirical testing of an integrative pedagogical framework that synchronizes Social Cognitive Theory (Bandura, 1997; Waddington, 2023) and Humanistic Educational Theory (Husnaini et al., 2024), demonstrating that stabilizing students' affective security serves as an absolute physiological prerequisite for unlocking working memory capacity and computational mastery. It is hypothesized that the systematic implementation of the four-stage CALM strategy produces a statistically significant enhancement in students' arithmetic achievement and Normalized Gain (N-Gain) compared to baseline conditions. The scope of this study is focused on fifth-grade madrasah students navigating the concrete-to-abstract arithmetic transition, providing an evidence-based pedagogical model for educational practitioners and curriculum designers in basic Islamic education.

2. Method

This study employed a quantitative approach with a pre-experimental one-group pretest-posttest design (Scott, 2019). This design was specifically chosen to evaluate the direct impact of the experimental intervention within an authentic, intact classroom setting where establishing an isolated control group was structurally unfeasible due to institutional class size limitations and administrative constraints (Creswell, 2018). In this framework, the pretest served as a baseline benchmark to measure initial numeracy skills, the CALM strategy functioned as the independent experimental variable, and the posttest served as the concluding measure to capture post-intervention learning gains. The design model of this research is illustrated in Figure 1.

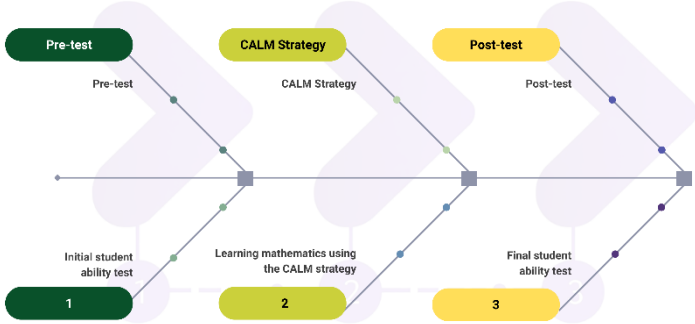


Figure 1. One-Group Pretest-Posttest Research Design

The population in this study comprised all elementary students enrolled at an Islamic elementary school in Semarang Regency, totaling 138 students across grades I through VI. The research sample consisted of 20 fifth-grade students (11 male and 9 female students, aged 10–11 years). Sample selection was carried out using the purposive sampling technique based on specific diagnostic considerations: (1) baseline diagnostic arithmetic evaluations showed that the fifth-grade cohort exhibited the lowest mean numeracy score (30.75), falling far below the institutional Minimum Mastery Criterion (*Kriteria Ketuntasan Minimal*/KKM = 70.00); (2) classroom teacher interviews and initial observations identified severe manifestations of mathematics anxiety, including operational freezing, task-avoidance, and computational distress; and (3) fifth-grade represents a crucial cognitive developmental milestone transitioning from concrete operational arithmetic to abstract proportional reasoning. All 20 selected students maintained a 100% attendance rate throughout the

intervention phase. Institutional clearance was obtained from the school authorities, and informed consent was secured from the participants' parents and teachers prior to the study.

The experimental intervention was systematically conducted over six instructional meetings, with each session lasting 70 minutes (2 × 35 minutes) embedded within the regular mathematics schedule across three consecutive weeks. The instructional intervention was facilitated by the primary mathematics teacher following a standardized lesson plan that operationalized the four sequential steps of the CALM strategy: (1) somatic relaxation (3–5 minutes of diaphragmatic square breathing and progressive muscle release at the opening); (2) cognitive restructuring (reframing negative math-related self-talk into constructive competence beliefs); (3) systematic desensitization (scaffolded arithmetic tasks organized from low-threat baseline computations to complex applications); and (4) effective learning development (explicit instruction on calculation heuristics, systematic problem-solving stages, and procedural error monitoring).

Data were collected through testing and non-test observation methods. The test method was employed to assess students' numeracy skills, administered before the intervention (pretest) and after the completion of the six CALM sessions (posttest). The test instrument comprised 15 constructed-response items designed to measure core numeracy dimensions across fifth-grade mathematics curricula. To clearly delineate between numeracy cognitive indicators and mathematical subject topics, the instrument blueprint is summarized in Table 1.

Table 1. Matrix of Numeracy Skill Indicators and Mathematics Subject Topics

No	Numeracy Skill Indicator	Mathematics Subject Topic	Cognitive Domain (Bloom)	Item Numbers	Total Items
1	**Basic Whole-Number Computation** *(Ability to accurately execute multi-digit operations: addition, subtraction, multiplication, and division)*	Multi-digit arithmetic operations and place-value computation	Applying (C3)	1, 2, 3, 4, 5	5
2	**Fraction Operational Calculation** *(Ability to perform operations involving common fractions and mixed numbers)*	Addition and subtraction of proper and mixed fractions with unlike denominators	Applying (C3)	6, 7, 8, 9, 10	5
3	**Contextual Problem-Solving** *(Ability to deconstruct arithmetic word problems and apply multi-step operational heuristics in real-world scenarios)*	Everyday applied word problems involving combined arithmetic and proportional reasoning	Analyzing (C4)	11, 12, 13, 14, 15	5

Total	**15**

Content validity was evaluated by three expert judges in mathematics education using Aiken's V formula, yielding an index of 0.88, which confirmed high content validity. The empirical reliability of the test was examined using Cronbach's Alpha, yielding a reliability coefficient of 0.84, which demonstrated strong internal consistency. Meanwhile, the observation method utilized a structured 12-item checklist assessed by an independent observer during every session to monitor the procedural fidelity of the teacher's CALM execution and record behavioral indicators of student anxiety reduction.

Quantitative data analysis was performed using SPSS statistical software version 25 through both descriptive and inferential statistical techniques. Descriptive statistics, including the calculation of mean scores, standard deviations, minimums, and maximums, were employed to summarize students' baseline and post-intervention numeracy performance across all measured indicators. For inferential statistical evaluation, the Shapiro-Wilk test was initially applied to verify data normality for the small sample size ($N = 20$), where a significance value of $p > 0.05$ confirmed a normal distribution. Subsequently, a Paired-Samples t-Test was conducted at a significance level of $\alpha = 0.05$ to determine whether the score improvements between the pretest and posttest were statistically significant. To measure the practical magnitude of the intervention, Cohen's d effect size was computed, where $d \geq 0.80$ represented a large effect. Furthermore, the Normalized Gain (N-Gain) was calculated using Hake's formula, $g = (\text{Posttest} - \text{Pretest}) / (\text{Maximum Score} - \text{Pretest})$, to objectively evaluate the effectiveness of the CALM strategy in enhancing numeracy skills without score ceiling bias, categorizing outcomes into High ($g \geq 0.70$), Medium ($0.30 \leq g < 0.70$), and Low ($g < 0.30$).

3. Results and Discussions

3.1 Results

3.1.1 Implementation of the CALM (Controlling Anxiety for Learning Mathematics) Strategy

The implementation of the Controlling Anxiety for Learning Mathematics (CALM) strategy was systematically executed across six instructional meetings by the classroom teacher, seamlessly integrating affective stabilization directly into the mathematics learning cycle. The operational execution followed four structured sequential phases: (1) relaxation techniques, (2) cognitive restructuring, (3) systematic desensitization, and (4) development of effective learning strategies.

In the first phase (relaxation), each session commenced with a 3–5 minutes somatic calming routine where the teacher guided students through diaphragmatic breathing exercises (inhale for four counts, hold for four counts, and exhale slowly) to release physical tension, reduce racing heart rates, and establish emotional composure prior to receiving mathematical stimuli. In the second phase (cognitive restructuring), the teacher facilitated a supportive dialogue to identify and reframe maladaptive thoughts, such as the catastrophic fear of making calculation mistakes, transforming them into constructive self-efficacy affirmations. In the third phase (systematic desensitization), arithmetic learning materials were presented across a graded hierarchy of difficulty, beginning with non-threatening foundational calculations and gradually advancing toward multi-step operations and applied word problems, allowing students to experience continuous micro-successes that steadily eroded conditioned fear. Finally, in the fourth phase (development of effective learning strategies), students were equipped with procedural problem-solving heuristics, including systematic steps to decode arithmetic tasks, structured scratchpad management, and self-

checking techniques. Classroom observation records verified that all four phases were consistently executed in each meeting, establishing a supportive, low-threat environment where students actively asked questions, engaged in peer discussions, and demonstrated sustained persistence without signs of avoidance or emotional distress.

3.1.2 Students' numeracy skills

The effectiveness of the CALM strategy in enhancing the numeracy skills of fifth-grade students was evaluated by comparing pretest and posttest scores across the 20 participating students. To provide a rigorous diagnostic evaluation as outlined in the instrument blueprint, the quantitative results broken down across numeracy skill indicators are presented in Table 2.

Table 2. Pretest and Posttest Results of Students' Numeracy Skills by Indicator

No	Numeracy Skill Indicator	Pretest Mean	Posttest Mean	Mean Gain	N-Gain	Effectiveness Category
1	Basic Whole-Number Computation	38.50	82.00	43.50	0.71	High
2	Fraction Operational Calculation	25.00	68.50	43.50	0.58	Medium
3	Contextual Problem-Solving	28.75	70.00	41.25	0.58	Medium
Overall	Cumulative Numeracy Performance	30.75	73.50	42.75	0.62	Medium

As delineated in Table 2, students demonstrated substantial enhancements across all three assessed numeracy dimensions. Prior to the intervention, students exhibited the greatest vulnerability in fraction operational calculation, recording a baseline average of only 25.00, followed by contextual problem-solving at 28.75 and basic whole-number computation at 38.50, all falling severely below the institutional Minimum Mastery Criterion (*KKM* = 70.00). Following the six-session CALM intervention, basic whole-number computation exhibited the most pronounced progress, surging by 43.50 points to reach a posttest mean of 82.00 (N-Gain = 0.71, classified as “High”). Fraction operational calculation also increased by 43.50 points to 68.50 (N-Gain = 0.58, “Medium”), while contextual problem-solving advanced by 41.25 points to reach 70.00 (N-Gain = 0.58, “Medium”).

Descriptive analysis of the overall scores revealed a remarkable upward shift in performance distribution: the minimum score recorded among students jumped from 20.00 at the pretest stage to 65.00 at the posttest stage, while the maximum score achieved increased from 50.00 to 80.00. Cumulatively, the overall classroom mean score improved by 42.75 points, rising from an initial baseline of 30.75 to a posttest average of 73.50. Notably, 100% of the participating students (all 20 respondents) experienced positive score gains. Before the intervention, not a single student (0%) met the institutional mastery standard of 70.00; however, following the implementation of the CALM strategy, 80% of the cohort (16 out of 20 students) successfully achieved or surpassed the mastery threshold.

To evaluate the statistical significance of these improvements, prerequisite normality testing was conducted using the Shapiro-Wilk test. The analysis yielded a pretest significance value of $p = 0.214$ and a posttest significance value of $p = 0.308$. Because both significance values were greater than 0.05, the data satisfied the assumption of bivariate normality. Subsequently, a Paired-Samples t-Test was conducted, resulting in $t(19) = 18.42$ with $p < 0.001$. This result confirms a statistically significant difference between students' baseline and post-intervention numeracy scores. Furthermore, the calculated Cohen's d effect size was 2.85, which substantially exceeds the benchmark for a large effect ($d > 0.80$), substantiating that the CALM strategy produced a profound practical impact on student arithmetic achievement.

A more comprehensive analysis of the intervention's efficiency was conducted through Normalized Gain (N-Gain) analysis to eliminate score ceiling biases arising from variations in initial baselines. The aggregate N-Gain results are summarized in Table 3.

Table 3. Summary of Overall N-Gain Score Calculation

Sample (N)	Average Pretest	Average Posttest	Average N-Gain	Effectiveness Category
20	30.75	73.50	0.62	Medium

Based on Table 3, the overall statistical calculation yielded an average N-Gain score of 0.62, methodologically classifying the CALM strategy within the "Medium" effectiveness category ($0.30 \leq g < 0.70$). This indicates that the intervention successfully accounted for a 62% improvement in students' numeracy skills relative to their maximum potential gain. An examination of individual N-Gain distributions demonstrated that 35% of students (7 participants) achieved high N-Gain scores ($g \geq 0.70$), 60% of students (12 participants) achieved medium N-Gain scores ($0.30 \leq g < 0.70$), and only 5% of students (1 participant) remained in the low category. This balanced distribution confirms that the instructional benefits of the CALM strategy were evenly distributed across the classroom cohort rather than confined to a select group of students.

3.2 Discussions

3.2.1 CALM (Controlling Anxiety for Learning Mathematics) Strategy

This study identified four stages of strategy implementation, *Controlling Anxiety for Learning Mathematics* (CALM), to reduce students' mathematics anxiety through four steps: relaxation techniques, cognitive restructuring, systematic desensitization, and the development of effective learning strategies. Strategy implementation, *Controlling Anxiety for Learning Mathematics* (CALM), in this study showed a significant advantage over conventional learning models, which are generally purely cognitive. If routine learning methods such as *drill and practice* directly focus on mastering counting procedures (Aprilia et al., 2024; Nurwiani & Tristanti, 2025), the CALM strategy initiates the intervention through relaxation stages to stabilize the student's affective state before exposure to the material (Text, 2023). The move shows similarities with the approach *of accelerated learning*, which prioritizes psychological comfort (Asri & Suhaili, 2022; Rose & Nicholl, 2023), but CALM has advantages in cognitive restructuring to convert numerical phobia into positive affects. The comparison confirms that the success of anxiety reduction in this study is rooted in a systematic procedure that prioritizes mental readiness before the transfer of numeracy knowledge. By mitigating physiological panic responses prior to instruction,

students are able to preserve essential working memory resources, enabling them to retain multi-step arithmetic algorithms without experiencing cognitive overload (Dowker et al., 2016; Rahmawati et al., 2024).

In practical classroom implementation, the CALM strategy engaged students in deliberate affective-regulation routines across every instructional phase. During the relaxation phase, students were guided through three to five minutes of seated diaphragmatic box breathing, synchronizing four-second intervals of inhalation, retention, and slow exhalation alongside intentional muscle relaxation in their hands and shoulders to down-regulate autonomic hyperarousal before instructional tasks commenced. Moving into cognitive restructuring, students participated in structured expressive dialogues where they articulated catastrophic inner worries, such as the dread of public failure, and consciously replaced them with teacher-facilitated affirmations emphasizing that calculation errors serve as natural milestones in mastering mathematics. Within the systematic desensitization stage, mathematical problems were organized along a carefully graduated hierarchy of difficulty, transitioning from low-threat baseline computations without time constraints to timed collaborative calculations and multi-step word problems, thereby cultivating continuous micro-successes that steadily eroded conditioned avoidance. Finally, the development of effective learning strategies equipped students with explicit metacognitive scaffolds, including scratchpad organizational habits, operational sign tracking, and a systematic three-stage heuristic model to deconstruct contextual arithmetic narratives.

Observational records and teacher self-evaluations revealed that cognitive restructuring constituted the most challenging stage for the teacher to implement. Fifth-grade students in rural madrasahs frequently exhibited deeply ingrained learned helplessness and an acute dread of social embarrassment stemming from historical reprimands for arithmetic errors. Consequently, prompting students to openly articulate their internal anxieties and replace self-defeating assumptions required sustained, non-judgmental teacher patience, ongoing verbal affirmation, and deliberate cultural shifts toward establishing mistakes as constructive learning feedback rather than evaluative failures.

The tangible reduction of mathematics anxiety among students was substantiated through behavioral metrics captured by the structured observation instrument across the six instructional sessions. At the baseline stage, anxiety manifested in acute physiological agitation and emotional avoidance symptoms, including nervous hand fidgeting, prolonged hesitation latency before writing down initial calculations, avoidance of eye contact when called upon, and immediate withdrawal when encountering multi-digit computations. Over the course of the CALM intervention, observation rubrics documented a marked decrease in these nervous behaviors: physical agitation declined, task-initiation latency dropped substantially, and voluntary classroom participation increased visibly. When calculation errors occurred during post-intervention sessions, students demonstrated cognitive persistence rather than shutting down emotionally, proving that their affective coping mechanisms had transitioned from helpless distress to resilient problem-solving.

The integration of measures into the CALM strategy demonstrates strong synergy between clinical-psychological and pedagogical aspects, a synergy rarely found in other intervention models (Antoniou et al., 2026). In contrast to general counseling, which is often conducted outside class hours, the CALM strategy is carried out simultaneously during math instruction, allowing students to practice anxiety management systematic*ally and in real time* when facing the challenge of counting (Ion & Popescu, 2025). The combination of systematic desensitization techniques and the development of effective learning strategies enables students to build self-coping mechanisms that traditional learning models do not.

The CALM strategy lowers emotional tension, making it easier for students to absorb complex math material. Because students experience anxiety reduction directly in the presence of mathematical tasks, the conditioned association between numbers and fear is actively dismantled during live learning, leading to immediate cognitive transfer and sustainable retention.

The CALM strategy in this study is based on the principles of cognitive psychology and social learning theory, which emphasize the importance of self-regulation for academic performance (Damayanti, 2026; Lestari et al., 2024). The alignment of the CALM step with the concept of cognitive restructuring enables a transformation in students' thinking schemes, from negative perceptions of numbers to more constructive self-confidence (Wafa et al., 2025). The strategy is also very relevant to humanistic theory in education, which holds that meeting students' emotional safety needs is the primary basis for creating a learning process (Husnaini et al., 2024). The implementation of CALM strengthens the postulate that the optimization of working memory function in solving numeracy problems is highly dependent on the stability of students' affective aspects during the learning process.

According to Bandura's Social Cognitive Theory, academic self-efficacy is cultivated through mastery experiences, emotional regulation, and verbal reinforcement. The graduated exposure in systematic desensitization provides continuous micro-successes that directly reinforce students' beliefs in their own mathematical capabilities (Bandura, 1997; Saputri et al., 2024). Concurrently, fulfilling the humanistic need for psychological safety creates a supportive classroom atmosphere in which mistakes are viewed as constructive learning feedback rather than sources of social humiliation.

3.2.2 The Effectiveness of the CALM Strategy on Students' Numeracy Skills

Data analysis using statistical tests showed strong significance in the improvement of students' numeracy skills at MI Bakalrejo after the implementation of the CALM strategy. Statistical significance was measured quantitatively by a shift in the average score from a baseline of 30.75 in *the pretest* to 73.50 in the *posttest*. This final evaluation, which exceeded the threshold of completeness, provided empirical confirmation of the intervention's success, carried out systematically in the classroom. The intervention's success was further validated by *an N-Gain* index of 0.62, which indicates effectiveness in the moderate category and a persistent impact on student learning outcomes. The large effect size of Cohen's $d = 2.85$ and the high t-statistic ($t = 18.42$, $p < 0.001$) demonstrate that this mathematical improvement was not a random testing artifact, but a direct outcome of the systematic reduction of affective interference accomplished by the CALM strategy.

A granular examination across specific numeracy skill indicators clarifies how affective stabilization directly unlocked discrete cognitive computational processes. Basic whole-number computation achieved the most pronounced surge, advancing from an initial mean of 38.50 to 82.00 with a high-category N-Gain of 0.71. Fundamental multi-digit operations, encompassing addition, subtraction, multiplication, and long division, depend heavily on working memory retrieval speed and phonological loop rehearsal. Prior to the intervention, arithmetic anxiety triggered acute cognitive freezing that disrupted mental carry-over and borrowing sequences, whereas the deployment of somatic relaxation and desensitization restored cognitive bandwidth, allowing students to execute procedural algorithms with fluid accuracy.

Meanwhile, fraction operational calculation showed substantial growth from an alarming baseline of 25.00 to 68.50, achieving a moderate N-Gain of 0.58. Because fractions demand the simultaneous coordination of dual-magnitude representations and common

denominators, they historically represent one of the most threatening topics in upper primary mathematics. While conceptual abstraction remained demanding for some students, the heuristic strategies established in the final stage of CALM enabled students to navigate fraction mechanics methodically without being overwhelmed by visual fraction complexity. Concurrently, contextual problem-solving progressed from 28.75 to 70.00, also yielding a moderate N-Gain of 0.58. Arithmetic word problems inherently impose high extraneous cognitive loads due to the simultaneous demands of linguistic comprehension and quantitative translation. Cognitive restructuring effectively mitigated initial task-avoidance, while structured heuristics empowered students to parse textual narratives into operational equations without succumbing to performance-induced cognitive overload.

The stability of the improvement in learning outcomes achieved by the study subjects was closely correlated with the reduction of mathematics anxiety accommodated through the operational procedures of the CALM strategy. This operational procedure, developed by Suinn and Edwards (1982), integrates relaxation protocols, systematic desensitization, and cognitive restructuring to simultaneously address students' mental barriers (Barski-Carrow, 2023). Minimized mental barriers through relaxation techniques play a vital role in suppressing negative physiological responses, thereby making students' cognitive load in manipulating numbers more efficient (Rahmawati et al., 2024; Sari et al., 2025). Cognitive efficiency ultimately facilitates a more accurate, calm, and structured process for solving counting problems than in pre-treatment conditions. When students are freed from the distracting internal noise of performance worry, their central executive resources can focus entirely on procedural calculations, resulting in significant reductions in computational mistakes and calculation speed delays.

This linear achievement demonstrates the synergy between the affective and cognitive domains, which is the core of the instructional process in madrasah ibtidaiyah. The instructional synergy is in line with Finlayson's (2014) research, which confirms that interventions with the combination of affective aspects in the form of anxiety management and cognitive aspects in the form of learning strategies have great potential to improve *Output* Math Learning (Hirzi & Ibrahim, 2025; Nasron et al., 2024). *O*ptimal learning occurs when students no longer allocate their mental energy to regulating fear but instead focus all their thinking resources on problem-solving strategies. This sharp focus on thinking ultimately led to a 42.75-point increase in scores for all grade V students at MI Bakalrejo. These findings corroborate recent empirical studies by Wang and Wei (2025) and Mangkuwibawa et al. (2024), which demonstrated that reducing affective anxiety in basic mathematics produces immediate, measurable gains in numeracy literacy across diverse primary school student demographics.

The novelty of this study lies in integrating anxiety-regulation strategies into regular mathematics instruction in a Madrasah Ibtidaiyah context. While prior investigations have predominantly confined mathematics anxiety interventions to secondary or tertiary students (Teklu, 2023; Wang & Wei, 2025), or delivered interventions via external psychological counseling detached from classroom dynamics, this research demonstrates that an elementary classroom teacher can seamlessly implement therapeutic anxiety-regulation routines within regular lesson schedules. Furthermore, it highlights that in resource-constrained rural madrasah environments where costly digital technology is unavailable, pedagogical restructuring targeting students' affective security can successfully mitigate profound numeracy deficits at virtually no financial expense (Ardianik & Hadi, 2022; Lusyana & Fahera, 2025).

The practical implications of these findings underscore the importance of integrating anxiety management into the implementation plan for elementary mathematics learning. The learning implementation plan should no longer focus solely on mechanistic formula transfer. However, it must also provide space for emotional stabilization so that the student learning window is opened to the maximum. Institutionalized emotional stabilization through the CALM strategy has the potential to reduce the number of math phobias at the next level of education, thereby improving the quality of national numeracy literacy sustainably. This increase in numeracy literacy will ultimately contribute to more holistic academic achievement and build students' confidence in facing the challenges of the data-driven digital era. Elementary mathematics teachers should be equipped through professional development programs to embed short relaxation routines and cognitive reframing into regular lesson plans, ensuring that classrooms function as psychologically safe environments for exploring mathematical concepts (Finlayson, 2014; Witono & Hadi, 2025).

Although the results show a significant positive trend, the limited number of samples covering only one experimental class calls for broader generalization in the future. Future studies involving control groups and longer intervention durations will be required to test the long-term resilience of the CALM strategy's effects. The resilience of these effects also needs to be studied at different grade levels to map the effectiveness of this strategy across diverse developmental age ranges. Varying developmental age ranges may give rise to different anxiety dynamics, so modifications of CALM measures need to continue to be developed adaptively to meet the heterogeneity needs of students in madrasas. Additionally, incorporating standardized mathematics anxiety psychometric scales alongside physiological biometric indicators in future research will yield deeper empirical insights into the neurocognitive mechanics of mathematics anxiety reduction.

4. Conclusions

This study concludes that the implementation of the CALM strategy is effective in improving numeracy skills among grade V students at MI Bakalrejo in Semarang Regency. It is proven that the average numeracy score of grade V students increased from 30.75 to 73.50, with an N-Gain score of 0.62 or an effective contribution of 62% in the medium effectiveness category. The statistical significance of this improvement is confirmed through a paired sample t-test showing $t(19) = 18.42$ ($p < 0.001$) and a large Cohen's d effect size of 2.85, where 80% of students successfully exceeded the institutional minimum mastery threshold. Theoretically, the study identified four steps in implementing the CALM strategy that strengthen Social Cognitive theory and Humanistic theory. The implications of this study show the importance of emotional stability as a fundamental prerequisite for the ability to calculate mathematical concepts. Pedagogically, the findings demonstrate that addressing students' affective distress through integrated relaxation, cognitive restructuring, and systematic desensitization within regular classroom instruction creates the necessary mental bandwidth for mastering complex arithmetic operations. This study has limitations in its research design, so future research is recommended to expand the population and use a longitudinal study design with randomized control groups to evaluate the long-term sustainability of the CALM strategy across diverse elementary educational settings.

References

Amanda, F., Nisa, S., & Suriani, A. (2024). Analisis kesulitan dalam pembelajaran matematika pada siswa sekolah dasar ditinjau dari berbagai faktor. *Dewantara : Jurnal Pendidikan Sosial Humaniora*, *3*(2), 282–293.

https://doi.org/10.30640/dewantara.v3i2.2652
Antara, I. K. J., Agustini, K., & Sudata, I. G. W. (2025). Model pembelajaran problem based learning berorientasi etnomatematika dalam meningkatkan kemampuan matematis siswa. *Journal of Education Action Research*, *9*(2), 288–297. https://doi.org/10.23887/jear.v9i2.87539
Antoniou, A. S., Charitaki, G., Pavlidou, K., & Alevriadou, A. (2026). Examining the relationships among burnout, mathematics self-efficacy, anxiety, and mathematical competence in primary and secondary students with Dyscalculia. In *Education Sciences* (Vol. 16, Issue 1, p. 48). https://doi.org/10.3390/educsci16010048
Aprilia, C. A., Patonah, S., Saadah, K., & Siswanto, J. (2024). Penerapan metode drill and practice sebagai upaya meningkatkan hasil belajar peserta didik materi menulis naskah pidato. *Ainara Journal (Jurnal Penelitian dan PKM Bidang Ilmu Pendidikan)*, *5*(4), 412–423. https://doi.org/10.54371/ainj.v5i4.607
Ardianik, A., & Hadi, U. (2022). Efektivitas penggunaan media pembelajaran dakonmatika untuk meningkatkan kemampuan berhitung siswa kelas IV SDN Kalanganyar Sedati Sidoarjo. *Jurnal Bidang Pendidikan Dasar*, *6*(2 SE-Articles), 159–168. https://doi.org/10.21067/jbpd.v6i2.6677
Asri, R., & Suhaili, N. (2022). Accelerated learning: a study of era Covid-19 experiences to improving student motivation. *Counseling and Humanities Review*, *2*(2), 55–62. https://doi.org/10.24036/000604chr2022
Bandura, A. (1997). Self-efficacy: The exercise of control. In *Self-efficacy: The exercise of control.* (pp. ix, 604–ix, 604). W H Freeman/Times Books/ Henry Holt & Co.
Barski-Carrow, B. (2023). *When trauma survivors return to work: Understanding emotional recovery*. Rowman & Littlefield.
Cosso, J., Ellis, A., O'Rear, C. D., Zippert, E. L., Schmitt, S. A., & Purpura, D. J. (2022). Conceptualizing the factor structure of parents' mathematics anxiety and associations with children's mathematics skills. *Annals of the New York Academy of Sciences*, *1511*(1), 119–132. https://doi.org/10.1111/nyas.14736
Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
Dafrinawati, D., Rasidi, R., Rahmawati, P., & Christi, A. M. (2023). Meningkatkan kemampuan berhitung perkalian melalui model pembelajaran Take and Give berbantu kartu hitung pada kelas III B SD Negeri Percobaan 2 Depok. *Jurnal Dimensi Pendidikan dan Pembelajaran*, *11*(1), 139–147. https://doi.org/10.24269/dpp.v11i1.8214
Damayanti, Y. D. (2026). Psikologi pendidikan: Memahami belajar, perkembangan, dan kecerdasan peserta didik. *Penerbit Tahta Media*.
Dowker, A., Sarkar, A., & Looi, C. Y. (2016). Mathematics anxiety: What have we learned in 60 years? *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.00508
Finlayson, M. (2014). Addressing mathematics anxiety in the classroom. *Improving Schools*, *17*(1), 99–115. https://doi.org/10.1177/1365480214521457
Gebauer, M. M., McElvany, N., Koller, O., & Schöber, C. (2021). Cross-cultural

differences in academic self-efficacy and its sources across socialization contexts. *Social Psychology of Education*, *24*(6), 1407–1432. https://doi.org/10.1007/s11218-021-09658-3

Hirzi, N., & Ibrahim, M. M. (2025). Inovasi media pembelajaran dalam meningkatkan keterlibatan siswa dengan teknologi interaktif di sekolah. *Proceeding International Seminar on Islamic Studies*, *6*(1), 2591–2597.

Husnaini, M., Sarmiati, E., & Harimurti, S. M. (2024). Pembelajaran sosial emosional: Tinjauan filsafat humanisme terhadap kebahagiaan dalam pembelajaran. *Journal of Education Research*, *5*(2), 1026–1036. https://doi.org/10.37985/jer.v5i2.887

Ion, T.-C., & Popescu, E. (2025). An innovative distance learning platform for mathematics education in secondary schools: Design, development and preliminary studies. *Education and Information Technologies*, *30*(5), 5529–5560. https://doi.org/10.1007/s10639-024-13040-z

Jannah, R., Soraya, R. A., Suriansyah, A., & Cinantya, C. (2024). Kemampuan berpikir kritis dalam pembelajaran matematika terhadap hasil belajar di sekolah dasar. *MARAS : Jurnal Penelitian Multidisiplin*, *2*(4), 1991–1998. https://doi.org/10.60126/maras.v2i4.550

Lestari, A., Oktavia, A., Saputro, E. W. A., Herlin, R., Azlan, N., Afriani, R., Sukma, A., Nurwin, E., Rajab, M., & Irawan, H. (2024). *Psikologi pendidikan*. Penerbit Widina.

Lusyana, E., & Fahera, N. (2025). Penerapan metode drill sebagai strategi peningkatan kemampuan berhitung siswa sekolah dasar. *Jurnal Al-Ilmu: Jurnal Penelitian dan Pendidikan Madrasah Ibtidaiyah*, *5*(1), 38–47. https://doi.org/10.63353/jurnalalilmu.v5i1.498

Lutfiyah, N., Shanie, A., Muhajirin, M., Damayanti, L., Fatah, N. A., & Fatikah, E. Y. U. (2025). Pengaruh stres akademik terhadap kesejahteraan psikologis siswa dalam konteks pendidikan Islam. *Jurnal Keguruan dan Ilmu Pendidikan (JKIP)*, *3*(4), 125–132. https://doi.org/10.61116/jkip.v3i4.825

Mangkuwibawa, H., Ramdhan, D. F., Mahmud, M. R., Siswanto, C. R., & Supriyadi, E. (2024). The effect of mathematics anxiety on students' numeration literacy ability. *Mudarrisa: Jurnal Kajian Pendidikan Islam*, *16*(1), 77–101. https://doi.org/10.18326/mudarrisa.v16i1.924

Mirawati, D., & Raharja, S. L. (2022). Penerapan media Loose Parts dalam mengembangkan kemampuan berhitung dan keterampilan motorik halus pada peserta didik TK A Sekolah Regina Pacis Jakarta Barat. *Jurnal Ilmiah Mandala Education*, *8*(3). https://doi.org/10.58258/jime.v8i3.3679

Nasron, Nurhasanah, Suranda, N., & Khadafi, M. (2024). Macam-macam perkembangan media pembelajaran dalam proses belajar mengajar di Indonesia. *Innovative: Journal of Social Science Research*, *4*(4), 1403–14057.

Nugroho, D., Untu, Z., & Samsuddin, A. F. (2023). Kecemasan matematika siswa ditinjau dari hasil belajar. *Jurnal Derivat: Jurnal Matematika dan Pendidikan Matematika*, *10*(1), 52–62. https://doi.org/10.31316/jderivat.v10i1.4540

Nurhaswinda, N., & Parisu, C. (2025). Kesulitan belajar matematika di sekolah dasar dan

solusinya. *Jurnal Pendidikan Multidisiplin*, *1*(1), 50–58. https://doi.org/10.54297/jpmd.v1i1.884

Nurwiani, & Tristanti, L. B. (2025). Independent samples t test and the mann-whitney-wilcoxon test to know the effect of the drill method on mathematics learning outcomes. *Journal of Modern Applied Statistical Methods*, *24*, 1. https://doi.org/10.56801/Jmasm.V24.i1.1

Rada, E., & Lucietto, A. M. (2022). Mathematics anxiety–A Literature review on confounding factors. *Journal of Research in Science, Mathematics and Technology Education*, *5*(2), 117–129. https://doi.org/10.31756/jrsmte.12040

Rahmawati, A. D., Ardianzah, F., & Novitasari, P. (2024). Penerapan teori beban kognitif dalam pengajaran matematika dalam mengurangi beban kognitif tak esensial. *Jurnal Jendela Pendidikan*, *4*(04), 463–472. https://doi.org/10.57008/jjp.v4i04.1112

Rose, C., & Nicholl, M. J. (2023). *Revolusi belajar accelerated learning for the 21st century*. Nuansa Cendekia.

Rukinah, R. (2023). Peningkatan kemampuan berhitung penjumlahan dan pengurangan melalui strategi problem based learning: (Penelitian tindakan kelas pada siswa Kelas 2 SDN Kasomalang VIII Kecamatan Kasomalang Tahun 2022/2023). *JPG: Jurnal Penelitian Guru FKIP Universitas Subang*, *6*(1), 88–96.

Sahrunayanti, S., Dema, M., & Wahyuningsih, W. (2023). Pemanfaatan media permainan Congklak dalam meningkatkan kemampuan berhitung siswa. *Jurnal Penelitian Inovatif*, *3*(2), 433–446. https://doi.org/10.54082/jupin.182

Saputri, A. K. R., Krisdiana, I., & Hidayati, S. N. (2024). Pengaruh mathematics anxiety terhadap hasil belajar melalui self efficacy pada siswa kelas VIII SMPN 3 Madiun. *Innovative: Journal Of Social Science Research*, *4*(3), 6994–7009. https://doi.org/10.31004/innovative.v4i3.11221

Sari, F. F., Sudatha, I. G. W., Santoso, M. H., & Suartama, I. K. (2025). Mengurangi beban kognitif dalam pembelajaran matematika: Tinjauan sistematis strategi dan intervensi pembelajaran. *Jurnal Pendidikan dan Pembelajaran Indonesia (JPPI)*, *5*(3), 1630–1644. https://doi.org/10.53299/jppi.v5i3.2190

Sofiannisa, S., Mori, R. H., Lisbeth, F. H., & Khairat, I. (2025). Teknik cognitive restructuring dalam konseling: Mengubah pola pikir negatif menjadi positif melalui pendekatan literatur. *Conseils: Jurnal Bimbingan dan Konseling Islam*, *5*(1), 119–128. https://doi.org/10.55352/bki.v5i1.1971

Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (kedua). ALFABETA.

Suinn, R. M., & Edwards, R. (1982). The measurement of mathematics anxiety: The mathematics anxiety rating scale for adolescents—MARS-A. *Journal of Clinical Psychology*, *38*(3), 576–580. https://doi.org/10.1002/1097-4679(198207)38:3<576::AID-JCLP2270380317>3.0.CO;2-V

Szczygieł, M., & Pieronkiewicz, B. (2022). Exploring the nature of mathematics anxiety in young children: Intensity, prevalence, reasons. *Mathematical Thinking and Learning*, *24*(3), 248–266. https://doi.org/10.1080/10986065.2021.1882363

Teklu, S. W. (2023). Analysis of fractional order model on higher institution students' anxiety towards mathematics with optimal control theory. *Scientific Reports*, *13*(1), 6867. https://doi.org/10.1038/s41598-023-33961-y

Waddington, J. (2023). Self-efficacy. *ELT Journal*, *77*(2), 237–240. https://doi.org/10.1093/elt/ccac046

Wafa, A., Syarifah, S., & Nadhif, M. (2025). Transformasi pembelajaran pendidikan agama Islam berbasis deep learning: Dari pendekatan hafalan menuju internalisasi nilai. *Academicus: Journal of Teaching and Learning*, *4*(2), 103–116. https://doi.org/10.59373/academicus.v4i2.95

Wang, X., & Wei, Y. (2025). The Influence of Gen-AI Assisted Learning on Primary School Students' Mathematics anxiety: An Intervention Study. *Applied Cognitive Psychology*, *39*(4). https://doi.org/10.1002/acp.70088

Witono, S., & Hadi, M. S. (2025). Numerasi dan kemampuan berpikir kreatif pada pembelajaran matematika di sekolah dasar. *JIIP - Jurnal Ilmiah Ilmu Pendidikan*, *8*(3), 2489–2496. https://doi.org/10.54371/jiip.v8i3.7180