

Designing an Affective-Constructivist Mathematics Model (ACMM) to Reduce Mathematics Anxiety among Elementary School Students: A Grounded Theory Study

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Abstract

Mathematics anxiety is widespread in Pakistani elementary classrooms due to exam-driven, procedural teaching, yet no context-specific solutions exist. Prior research measures anxiety levels but does not explain its classroom development or offer frameworks designed for Pakistani schools. This study explored students' lived experiences of mathematics anxiety and developed the Affective-Constructivist Mathematics Model (ACMM) to reduce anxiety while promoting confidence and conceptual understanding. Using Constructivist Grounded Theory, data were collected from 36 elementary students and five teachers across five Pakistani schools through interviews, focus groups, classroom observations, and longitudinal case studies over sixteen weeks. Analysis revealed four emergent themes embodied anxiety, fear of public performance, negative mathematical identity, and strategic avoidance which converged into the Cycle of Mathematics Fear and Avoidance as the core category explaining how anxiety developed and persisted. The empirically derived model comprises four instructional stages (Launch, Explore, Discuss, Reflect) supported by an Affective Safety Core that promotes emotional security, error tolerance, and active participation. The ACMM provides a practical framework for teachers, curriculum developers, and policymakers to create supportive mathematics classrooms that interrupt anxiety cycles and strengthen student engagement.

Keywords: Mathematics anxiety, constructivist pedagogy, elementary education, grounded theory, Affective-Constructivist Mathematics Model (ACMM)

I. Introduction

While mathematics is essential to everyone's scientific literacy, technological innovation and workforce development it is one of the most anxiety provoking subjects in formal education. The expression 'maths anxiety' is not just a short-lived state of nervousness but is defined as a long term emotional state of fear, tension and avoidance of mathematics in relation to mathematical activities. According to Rohati et al. (2023), extensive research has shown that mathematics anxiety has negative effects on working memory, problem-solving ability, classroom participation and academic performance, even for individuals who have good cognitive abilities. Evidence from around the world also shows that students who are anxious about mathematics do significantly worse on mathematical achievement tests than those who are not anxious. This suggests that emotional factors can be as important as intellectual ones in determining a student's mathematics scores. As a result, the mathematical anxiety phenomenon has become a big problem in education, limiting current academic performance and future involvement in STEM education.

One problem is the lack of support for developing educational systems, where the structural and instructional limitations of the system are reinforcing students' negative mathematical experience. The delivery of mathematics in Pakistan today is still largely based on examination-based assessment, procedures and memorization, and there is still insufficient scope for conceptual understanding, collaborative learning, and reflection. The authors of the study by Li et al. (2023) noted that these classroom

environments often become places of embarrassment, rather than learning opportunities, leading to feelings of fear, avoidance, and loss of confidence from the early stages of schooling. Research has linked mathematics anxiety to poor conceptual understanding, negative student/teacher relationships, lack of support in the classroom, and lack of relationships between mathematics and real-life situations. All of these factors point to the fact that mathematics anxiety is not just a psychological phenomenon, but an educational phenomenon that involves classroom practices, teacher behaviour, and the overall educational context.

While there have been many studies on mathematics anxiety, the majority of studies have used quantitative survey methods to assess anxiety levels and their association with academic achievement. This kind of strategies pinpoint the magnitude of the issue, but fail to give knowledge of how contextually suitable use of mathematics can diminish mathematics anxiety or how mathematics anxiety grows in the normal classroom. In addition, most of the models of intervention have been designed for high resource educational context and have low applicability in the Pakistani elementary classroom. The study is meant to overcome these limitations by applying the Constructivist Grounded Elliott et al. (2020). Theory approach that investigates the lived experiences of students and teachers before developing the Affective-Constructivist Mathematics Model (ACMM) which is an instructional model that can be used to minimize mathematics anxiety and increase confidence, participation and conceptual understanding.

This research was prompted by the continued gap between the results of many studies on mathematics anxiety and the scarce practical and contextually relevant instructional interventions available for elementary classrooms. Previous studies mostly addressed why some students experience math anxiety; there is less guidance to help teachers to address math anxiety in the classroom. In addition, education policies are more and more focused on conceptual understanding, student involvement and STEM engagement, with insufficient models of emotionally supportive teaching in resource-poor environments. The Affective-Constructivist Mathematics Model (ACMM) was developed as a result of these concerns, working based on the Constructivist Grounded Theory method to create a theoretically rich and practically applicable model that can enhance both students' emotional health and math learning.

The problem of mathematics anxiety in Pakistani elementary schools persisted as an obstacle to meaningful mathematics learning as often, mathematics was taught to prepare students for examinations, mathematics was taught to perform procedures, and students lacked opportunities to deepen their conceptual understanding Fatima et al. (2025). Previous investigations pointed to certain essential factors for the development of mathematics anxiety and positive results of constructivist instruction, but they were not able to describe the processes which occurred in the classroom where mathematics anxiety was developing and how instruction was able to systematically change the emotional experiences of the learner. Limited teachers' capacity to address mathematics anxiety due to the lack of contextually grounded instructional framework. Hence, the creation of an empirically conceptualised constructivist model was important to facilitate an emotionally safe mathematics learning environment and to enhance learners' confidence, participation and conceptual understanding within the realities of Pakistan elementary school education Mukherjee (2025).

The purpose of this study was to shed light on the lived experiences and underlying causes of mathematics anxiety and to identify a context-specific instructional framework based on a Constructivist Grounded Theory. The study suggests the Affective-Constructivist Mathematics Model (ACMM) based on students' experience, teachers' perspective and classroom observation in order to minimize the mathematics anxiety phenomenon and increase the students' level of confidence, participation and concept in learning mathematics Corbeil et al. (2021). This study makes a contribution to mathematics education by giving a context-specific framework of reducing mathematics anxiety in elementary classrooms Arslan et al. (2024). The proposed Affective-Constructivist Mathematics Model (ACMM) provides practical advice to teachers for designing an affective and constructivist approach to teaching mathematics that fosters learner confidence, involvement and understanding. The results also hold implications for teacher educators, curriculum designers and policy makers in looking for ways to enhance mathematics learning. The study is the first of its kind that used Constructivist Grounded Theory Methodology to build an instructional model to decrease mathematics anxiety in the elementary education of Pakistan. This study differed from the previous studies in that it constructed the Affective-Constructivist Mathematics Model (ACMM) directly from the students' lived experiences, teachers' perceptions and classroom observations, resulting in a contextually robust and practically meaningful model..

2. Literature Review

2.1 Mathematics Anxiety in Elementary Education

There is a feeling of anxiety about mathematics that has been placed within the cognitive, emotional and classroom-based arena, and not just the fear of numbers. Tanjung et al. (2024) conducted a systematic review of studies on primary level to synthesise the findings and concluded that anxiety emerged due to learner beliefs, instructional practices, and environmental pressures, but due to the differences among the studies, the conclusions were not definitive. In the case of teacher support, Li et al. (2023) revealed that the anxiety decreased with high learning engagement, and in the case of perceived learning cost, St Omer and Chen (2023) revealed that the anxiety increased and the achievement decreased with high perceived learning cost. Both studies, however, focused largely on statistical associations and failed to provide information about classroom processes. Öztürk et al. (2021) used questionnaires and interviews to find a correlation between anxiety with fear of failure, examination pressure, and negative classroom experiences, but their cross-sectional design did not allow for causal interpretations. Furthermore, the chain mediation model proposed by Ma et al. (2026) indicated that the anxiety of students was alleviated by increasing self-efficacy and decreasing procrastination, which

were caused by teacher support. These two studies together provided a major account of the factors and processes that account for anxiety but provided little understanding of how these processes were being manifested in the actual classrooms.

Useful instructional and qualitative research added to the understanding, but it was still piecemeal. A constructivist intervention was found to decrease anxiety; however, the results were not generalisable due to the small sample size and short duration (Elgendy, 2020). Based on the results of Tallman and Uscanga (2025), it was discovered that the supportive interaction was able to make the anxiety in the process of learning mathematics in the online medium, but the application of supportive interaction was still limited in conventional classrooms. While not offered as an underlying emotional mechanism, Ergan (2025) suggested shame. Pahmi et al. (2025) and Cross Francis et al. (2020) applied qualitative method and found that teachers' academic and pedagogical emotions influenced the classroom climate; Yue et al. (2023) and Victoria-Delgado (2024) adopted grounded theory to reveal that educational anxiety emerged from social and institutional interactions. García-García et al. (2024) proved that the 5E model positively increased students' self-efficacy in learning geometry, while Rohati et al. (2023) employed Grounded Theory for the mathematical reasoning behaviour. Lyster (2024) also validated its use of Grounded Theory in another schooling context to study learning anxiety. Although these efforts were made, none of the studies combined and analyzed the lived experiences of elementary students, teacher perspectives, observations, and the development of a constructivist model that could be applied specifically in the Pakistani context to ease math anxiety among students.

2.2 Constructivist Pedagogy and Mathematics Anxiety

Constructivist pedagogy emphasized that the learning process of mathematics was not merely the process of transferring procedures of learning, but it was a process of learning that was carried out through exploration, dialogue, problem solving, reflection, etc. Although this was not tested empirically, Thompson (2020) theorized that this position was most conducive to the development of conceptual understanding. This mechanism was generally supported by empirical studies. A single site design resulted in constructivist-aligned strategies showing positive results for the mathematical identity of fifth-grade students, with positive results in terms of participation and reduced fear of failure (Ledbetter, 2020). Kalati et al. (2025) used an instructional intervention which resulted in achieving improvement in achievement and attitudes, but the focus of this research was on achievement rather than emotional change. Likewise, Subramaniam and Saleh (2024) created the GeoExplorer gamification platform, which enabled students to investigate and explore mathematics and reduced mathematics anxiety, but was designed with technology and therefore not widely applicable in low-resource classrooms. Collaborative interaction, instructional presence, and structured feedback also were found to lower anxiety in online mathematics learning, however, the online environment did not allow for direct comparisons with face-to-face elementary classrooms (Tallman and Uscanga, 2025). D'Souza (2025), in the absence of direct classroom evidence, synthesized theory-based interventions and suggested that they could all be seen as effective for reducing anxiety, especially when used in combination.

In the case of the Qualitative and Grounded Theory studies, the mechanisms of the constructivist approach were clarified, though most of these studies focused on teachers or environments outside of elementary mathematics education. Wielinski (2023) and Spann (2025) adopted qualitative approaches of a case nature, and they concluded that teachers' perception of constructivist and concept-based teaching linked to deeper understanding, student autonomy, and participation, but faced challenges with time, curricular requirements, and assessment pressure. Pahmi et al. (2025) demonstrated, however, that teachers' academic and pedagogical anxiety had a positive impact on teachers' instructional behaviour, which in turn positively affected the emotional safety in constructivist classrooms. Both studies were intensive, with either Grounded Theory (Phan, 2026) or intensive single case analysis (Wahyuningrum et al., 2026) providing in-depth insights with limited generalisability. Hughes (2024), Salvador et al. (2020), and Kadonsi (2025) also suggested that collaborative reflection, culturally responsive support, and resilience-building contributed to decreasing educational fear by fostering a sense of belonging, agency, and positive identity formation, but these contexts did not only apply to educational fears regarding elementary mathematics. Overall, these studies indicated that constructivist teaching methods decreased anxiety through increasing self-efficacy, acceptance of errors, social support and promoting autonomy. To date, however, no study had included students' experiences, teachers' perspectives, and classroom observation to create an affective-constructivist model for Pakistani elementary schools in a context-specific manner.

Table I: Comparative table of previous studies

Reference	Method	Main Finding	Limitation	Relevance
Tanjung et al. (2024)	Systematic review	Anxiety arose from cognitive, instructional, and environmental factors.	Studies were highly varied.	Confirmed the multidimensional nature of anxiety.
Li et al. (2023)	Four-wave longitudinal study	Teacher support reduced anxiety through engagement.	Classroom processes were not observed.	Supported teacher support in ACMM.
Öztürk et al. (2021)	Mixed methods	Fear of failure and exam pressure increased anxiety.	Cross-sectional design.	Identified major classroom triggers.
Ma et al. (2026)	Mediation analysis	Support improved self-efficacy	Relied on self-	Highlighted self-efficacy as

		and reduced procrastination.	report data.	a mechanism.
Ledbetter (2020)	Action research	Constructivist teaching improved identity and participation.	Single-site study.	Supported active, error-tolerant learning.
Subramaniam and Saleh (2024)	Platform development	Gamified learning reduced anxiety and increased engagement.	Required digital resources.	Supported autonomy and exploration.
Pahmi et al. (2025)	Phenomenology	Teacher anxiety shaped classroom climate.	Focused on pre-service teachers.	Showed the role of teacher emotions.

3. Methodology

3.1 Research Paradigm and Design

The study took place in an interpretivist paradigm, in which it was believed that mathematics anxiety could be interpreted in terms of meanings attributed to the mathematics classroom experiences of students and teachers. The study did not focus on anxiety as a constant but rather on the experience of anxiety, its expression, concealment, and reinforcement in interaction. The design used was a Constructivist Grounded Theory which allowed them to construct a model that explains the data rather than test a pre-existing one. This design was suitable because it was designed to develop the Affective-Constructivist Mathematics Model (ACMM) based on the account of the participants and the observed classroom practices.

3.2 Research Setting

The data was obtained from 5 elementary schools of Bahawalpur in Punjab, Pakistan for sixteen weeks. These sites were two government schools and three private schools representing various differences in school type, class size, language of instruction, resources, and assessment practices. The average size of government-school classes was 45–61 students, while the average size of the private-school classes was 22–40 students. During the teaching of mathematics, Urdu, Saraiki and Urdu–English code switching were found prevalent. This variation allowed for comparison of shared and school-specific sources of mathematics anxiety.

3.3 Participants and Demographic Profile

The final sample consisted of 36 children (Grades 1–8) and five practising mathematics teachers. Students were nominated if nominated by the teacher, self-reported in the age appropriate questionnaire, and if identified through the use of the prelim questionnaire. There were 19 girls and 17 boys in the sample. The teachers ranged from 3–21 years of teaching experience and were from government and private schools. Three students with marked anxiety were also followed as 'longitudinal' cases.

Table 2. Demographic profile of participants

Participant group	Number	Gender/Composition	Key characteristics
Grades 1–3 students	13	7 girls, 6 boys	Lower elementary
Grades 4–8 students	23	12 girls, 11 boys	Upper elementary
Mathematics teachers	5	2 government, 3 private	3–21 years' experience
Longitudinal cases	3	1 boy, 2 girls	Grades 3, 5, and 7
Total participants	41	19 girls, 17 boys, 5 teachers	Five schools

3.4 Sampling Procedure

Purposive sampling was used to recruit the initial participants in order to obtain information-rich participants that exhibited fear, hesitation, avoidance, physical tension, or low confidence in mathematics related activities. Triangulated screening minimized reliance on teacher's judgment alone and brought to light students' internalized anxiety. Theoretical sampling was employed to help explain the evolving categories following initial coding. To examine how anxiety was expressed by girls in the upper elementary grades, a further six additional girls from a government school were recruited. The sampling procedure was continued until the categories reached conceptual development and no new properties formed from a substantive dimension were observed.

3.5 Data Collection

A total of four complementary methods were used. Initially, individual semi-structured interviews were conducted that focused on experience of fear, public performance, examinations, mistakes, teacher reaction, and coping behaviour. Teachers were interviewed to discuss pupils' anxiety, teaching methods, limitations of the classroom, and constructivist teaching. Second, 34 students participated in five focus groups, where participants responded to each other's experiences. Third, 28 structured non-participant classroom observations recorded teacher–student interactions, error responses, student participation, student hesitation, and visible student distress. These comprised 16 baseline observations, and 12 observations following the introduction of ACMP practices. Fourth, three longitudinal cases were followed for 12–14 contact points over a period of 14 weeks to test the changes in anxiety

and participation over time. The entire corpus consisted of 28 observations, three focus groups, 19 hours of student interviews, and seven hours of teacher interviews, and three longitudinal case records.

3.6 Data Analysis

Data collection and analysis were carried out simultaneously. The analyses of the interviews, focus group notes, observations notes and the case files were conducted using open coding, focused/axial coding and selective coding, with the support of constant comparison and memo writing. Open coding was very close to the "words" and "actions" of the participants. Focused coding and axial coding built the relationship between codes, coded similar concepts, and coded the consequences of conditions. Selective coding integrated the categories around the central process explaining how mathematics fear was produced and maintained.

The analysis resulted in 612 initial codes, 47 focused codes, 11 subcategories, six axial categories and one core category. Comparisons were made by gender, grade level, school type, participant group and data source. The ACMM was then constructed by transforming the anxiety-provoking categories into related teaching responses, without losing any link to the empirical data.

3.7 Trustworthiness

Credibility, dependability, confirmability and transferability were used to ensure methodological rigour. Increased credibility was achieved by conducting long-term fieldwork, triangulation of interviews, focus groups, field observations, and case studies, and comparison of student and teacher narratives. Interpretations by the participants were reviewed in subsequent discussions and some excerpts were back-translated from the translated version. An audit trail, documenting sampling choices, coding changes, analytical memos, and the development of models, provided support for dependability. Reflexive notes were kept to uncover potential researcher assumptions. Thick description of school, participant and classroom contexts helped readers evaluate the generalizability of the results. The analysis was analytically, not statistically generalisable.

3.8 Ethical Considerations

Ethical clearance was granted by the university research committee, and then clearance from the school administrations. Teachers and parents/guardians gave written consent and children gave age appropriate assent. Participants were not obliged to participate, and could withdraw at any time without penalty. Details in case narratives were removed and identification codes and pseudonyms were used in transcripts and reports. Interviews took place in non-evaluative, calm environments, to minimize participants' anxiety. All records were kept in a secure location and for research only.

4. Results

4.1 Participant Profile and Analytical Overview

The analysis was conducted based on qualitative data obtained from 36 elementary students and five mathematics teachers in five schools through interviews, focus group discussions, classroom observations, and case study. The initial codes totaled 612, which were reduced to 47 focused codes, 11 subcategories, six axial categories and one core category through the process of constant comparison. The results showed that mathematics anxiety was not just an emotional issue for the individual but the classroom phenomenon related to previous learning experiences, teacher behaviors, peer relationships, and assessment culture. The Core category that emerged from across the participants was a Cycle of Mathematics Fear and Avoidance, which was the impetus for the development of the Affective-Constructivist Mathematics Model (ACMM).

4.2 Emergent Theme I: Mathematics Anxiety as an Embodied Experience

The first emergent theme that came to light was mathematics anxiety, which was understood as a whole-body experience that involved physiological, emotional, and behavioural reactions to the experience of mathematics. Participants regularly reported that their heart beat would get faster, they would shiver, sweat, and be confused about what to do and would not be able to focus when they tried to do any maths problems, especially when given on the board or asked by the teacher. These answers showed that students' mathematical thinking was often preceded by anxiety which makes their thinking in learning task not ready. Classroom observations confirmed these reports and exhibited that anxious students often evaded eye contact, did not speak, postponed starting tasks, frequently erased written assignments, and did not participate in classroom interaction despite a conceptual understanding of the concepts. Such actions were in line with self-protective coping mechanisms designed to prevent further humiliation in public, not with the absence of math skills.

In an analytical sense, it was clear that mathematics anxiety built up as a result of repeated classroom experiences in which fear of evaluation was internalized within students' learning process. The constant criticism, mistake correction in public, exam pressure, and negative teacher reactions caused students to focus more on avoiding errors, which undermined their ability to learn, participation level, and mathematical confidence. These findings help to advance the previous quantitative studies by clarifying how teacher behaviour, assessment practices, and classroom culture manifested in the embodied anxiety that occurred in everyday learning. The results are also consistent with constructivist learning theory which indicates that a mathematics classroom that is free from mathematics anxiety must be emotionally supportive, mistakes should be treated as learning opportunities, the class should not judge the student's participation, and conceptual understanding should be emphasized rather than performance, which will serve as the pedagogical basis for the implementation of mathematics anxiety reduction using the Affective-Constructivist Mathematics Model (ACMM).

4.3 Emergent Theme 2: Fear of Public Performance

Fear of public performance emerged as a second recurring theme, indicating that this was an important factor in mathematics anxiety. The participants all reported that being embarrassed, fearful of failure to solve problems on the board, answer questions in front of classmates, or being corrected in front of the students made them feel bad. Consequently, many students did not look into the teacher's eyes, did not speak or did not do the exercises even though they knew the math concepts. The reluctance of the students was found to be a result of negative evaluation rather than of their lack of mathematical ability as revealed from the classroom observations, and that the public correction by the teachers often led to the loss of confidence and willingness of the students to participate in the classroom was also revealed. As to the analytic aspect, the present results indicate that the experience of public judgement is not a necessary condition for the reinforcement of mathematics anxiety; that is, mathematics anxiety was reinforced by repeated experiences of public judgement and not only by mathematics difficulty. Constant criticism, comparison from peers and correction of errors fostered avoidance behaviours and reinforced lack of confidence in mathematics. This result supports previous research by demonstrating that mathematics anxiety was maintained in the classroom via the public evaluation. Constructivist views support the importance of creating an emotionally safe environment in the classroom for students to learn together, provide support feedback and embrace mistakes, aiding in the mitigation of student fear of participation and fostering meaningful engagement in mathematics.

4.4 Emergent Theme 3: Development of a Negative Mathematical Identity

The third emerging theme was that the more one had experienced mathematics anxiety, the more one eventually felt like a negative mathematical identity. Many of the participants reported that they were "weak in mathematics", "slow learners" or "unable to solve mathematics problems", despite their ability being observed during the classroom session, where many were seen as having good conceptual understanding. Students were told that they were unable to improve their skill at maths, as repeated failure, criticism from teachers and peers, and poor exam results reinforced these negative self-perceptions. From an analytical perspective the results show that mathematics anxiety transformed from a passing feeling to a permanent attitude which affected the students' future motivation and learning activities. Students who developed the myth that they were not good at math, found tasks more difficult, were less inclined to try more challenging problems, to voice their ideas, or to persist when they made errors. The present finding adds to earlier studies, which has shown that negative mathematical identity was the psychological mechanism through which repeated classroom anxiety was associated with long-term disengagement from mathematics. A constructivist stance suggests that a focus on progress, an emphasis on effort and a supportive feedback system should be used in the learning environment to strengthen positive mathematical identity through successful learning experiences, indicating that evaluation should not be repeated.

4.5 Emergent Theme 4: Strategic Concealment and Avoidance

The fourth emergent theme was that students learned strategic ways of concealment and avoidance as means of protecting themselves from embarrassment and failure. Most of the participants did not participate in mathematics lessons; did not volunteer often; copied others' work; were silent when the teacher spoke; or intentionally sat in a location where they would not be the first to be called on by the teacher. Some students also delayed their mathematics homework or memorized mathematics facts to bypass conceptual problem solving. These behaviours helped to alleviate emotional distress in the short term, but were also hindrances to developing mathematical understanding and confidence. Behaviourally, avoidance was seen in the context of repeated anxiety, rather than as a cause of anxiety. Every successful attempt to get away from public assessment lowered the acute fear, but also gave students confidence that math was a threat, thus creating a vicious cycle of withdrawal, decreased participation, and decreased achievement. This finding illustrates the avoidance as a behavioural process that maintained mathematics anxiety over time. To break this cycle, a constructivist approach suggests the need for classroom practices that promote gradual participation, the use of errors as learning moments, and the provision of positive feedback so as to foster a sense of agency and confidence among students as they engage with the material instead of avoiding it.

4.6 Core Category: Cycle of Mathematics Fear and Avoidance

The emergent themes coalesced into one central theme, the Cycle of Mathematics Fear and Avoidance, which accounted for the development and maintenance of mathematics anxiety in elementary classrooms. The analysis revealed that most often, anxiety started with negative classroom experiences, these included fear of public evaluation, repeated criticism or anxiety about an examination. Students' confidence was weakened and avoidance of mathematics activities was increased as immediate emotional and physiological responses resulted from these experiences. Avoidance restricted participation in class, undermined conceptual knowledge and perpetuated students' sense of inability to learn mathematics. This negative self-perception made learning experiences with anxiety more recurrent, thus perpetuating the negative self-perception in the learning process. From the analytical perspective, the core category confirmed that mathematics anxiety did not stem from a single cause but rather, resulted from a combination of classroom practices, teacher behaviours, peer comparison and self-beliefs of the students. Each stage reinforced the next, making it more and more difficult to overcome anxiety without an intentional instructional approach. This is the reason why some students still felt anxious when dealing with mathematical problems, although they have the cognitive ability to address them. The results thus complement the previous studies by providing a process-oriented account of the generation, continuation and strengthening of mathematics anxiety over time rather than just accounting for the predictors of mathematics anxiety. This core

process provided the theoretical base for the development of the Affective-Constructivist Mathematics Model (ACMM), which was specifically designed to break this cycle of fear, avoidance, and negative evaluation by bringing into mathematics learning emotionally supportive and constructivist experiences.

4.7 Development of the Affective-Constructivist Mathematics Model (ACMM)

The results of the Grounded Theory analysis were directly obtained from students' lived experiences, teachers' views and classroom observations, and culminated in the development of the Affective-Constructivist Mathematics Model (ACMM). The model avoided an external intervention and was applied to the identified sources of mathematics anxiety in the form of practical constructivist teaching strategies. 4 instructional phases - Launch, Explore, Discuss, Reflect, plus an Affective Safety Core that fosters trust, error tolerance, emotional security and active participation. Each stage was developed to support a particular mechanism in the Cycle of Mathematics Fear and Avoidance, and was intended to change the kinds of classroom experiences that might cause fear and avoidance, into meaningful learning experiences. Emotionally, the ACMM is an extension of constructivist learning theory because it combines the emotional support aspect into concept based mathematics learning. The model moves away from teacher-led assessment to learner-led inquiry, shifting away from fear of failure towards joint problem solving, helpful feedback, and reflective inquiry. The ACMM integrates the emotional, cognitive, and social aspects of mathematics learning, thus offering a contextually-rich approach to addressing mathematics anxiety and boosting confidence, participation, and conceptual understanding. Unlike the previous mode of intervention, which were mostly adopted from the external context, or evaluated predetermined programmes, the ACMM was inductively generated from the Pakistani elementary classrooms and thus grounded theoretically and practically in similar educational contexts.

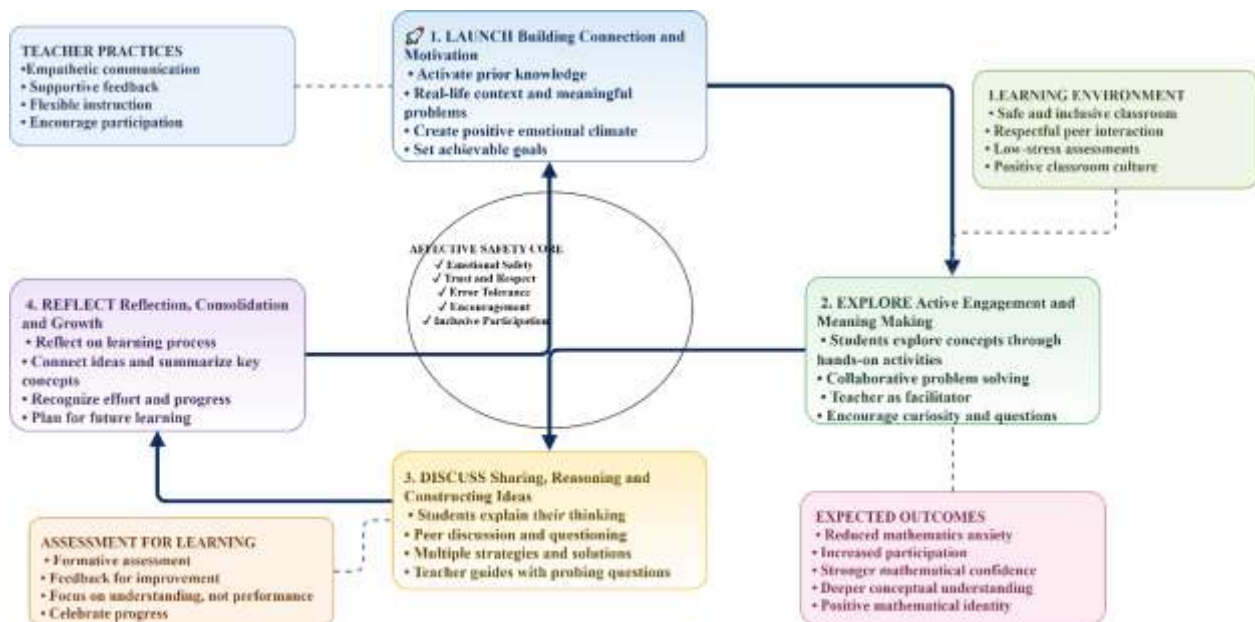


Figure 1. Affective-Constructivist Mathematics Model (ACMM)

The Grounded Theory findings led to the development of the proposed Affective-Constructivist Mathematics Model (ACMM) as is shown in the Figure 1. The model illustrates the effect emotionally supportive and constructivist teaching can have on interrupting the Cycle of Mathematics Fear and Avoidance. There are four phases – Launch, Explore, Discuss and Reflect – linked together and supported by an Affective Safety Core, which fosters emotional security, trust, error tolerance, and active participation. As a whole, these elements create a mathematics classroom that moves away from performance and towards learner-centered instruction, which increases confidence, engagement, and conceptual understanding while decreasing mathematics anxiety.

5. Discussion

The study illustrated that mathematics anxiety was not the result of students' limited ability in mathematics but rather the result of a continuous process of interaction between the emotions of students, classroom practices and social experiences. The Cycle of Mathematics Fear and Avoidance was articulated by the emergent themes: embodied anxiety, fear of public performance, negative mathematical identity, and strategic avoidance. These results suggest that anxiety is a pedagogical and social process in which participation, confidence and conceptual understanding gradually decrease. The formation of the Affective-Constructivist Mathematics Model (ACMM) also demonstrated that if one interrupts this cycle something that promotes meaningful learning of mathematics is produced: an affectively supportive constructivist teaching.

The results are similar to the other studies that identified teacher support, examination pressure, self-efficacy and fear of failure as important factors that contribute to mathematics anxiety (Li et al., 2023; Ma et al., 2026; Öztürk et al., 2021). In addition, they provide evidence to support that constructivist teaching lowers anxiety through the active learning and collaboration (Elgendy,

2020; Ledbetter, 2020; Kalati et al., 2025). In contrast to previous studies based on survey and intervention, the current study has offered an explanation of the development of mathematics anxiety in the context of everyday classroom experiences in terms of students' experience, teachers' perspective and classroom observations, thereby offering deeper and context-specific explanation of the mathematics anxiety.

5.1 Theoretical Contribution

The study builds on Constructivist Grounded Theory and constructivist learning theory, showing that mathematics anxiety is not a stand-alone emotional state but instead it is a process that takes place in the classroom. The Cycle of Mathematics Fear and Avoidance provides a process-oriented description of the development of anxiety and the ACMM provides a practical instructional framework based on this process-oriented description of anxiety development. This contribution is a bridging between the affective learning and constructivist teaching of mathematics, combining emotional safety and conceptual learning.

5.2 Practical Implications

The results indicate that reducing mathematics anxiety has nothing to do with providing more resources in the classroom, but with changes in them. Teachers should promote collaborative learning, embrace errors as learning experience, give positive feedback and focus on conceptual learning rather than on the stage appearance. The ACMM provides teachers, curriculum designers, and teacher educators with a practical framework that can help build students' confidence, engagement, and learning in an emotionally supportive math classroom.

The methodological triangulation of the interview, focus group, classroom observation and longitudinal case studies in a Constructivist Grounded Theory design was one of the great strengths of this study as it enhanced the credibility of the findings. The findings of the study though achieved with 36 students and five teachers from five schools of one district in Pakistan, are analytically transferable in the educational context that has a similar classroom context. The ACMM can be validated and extended in the future in mixed-method or intervention-based studies in varying educational settings.

5. Conclusion

This study showed that mathematics anxiety among elementary students in Pakistan is not just a personal cognitive problem, but is an outcome of the classroom phenomenon created in repeated interactions of public evaluation, criticism of errors, teacher response and comparison among peers. The Cycle of Mathematics Fear and Avoidance explained how the anxiety grew, as the avoidance of mathematics was continuously reinforced by anxiety, avoidance, negative self-beliefs and non-participation in mathematics, making it increasingly difficult to overcome without conscious instructional intervention. The findings have been translated into a contextually based framework for teaching mathematics called the Affective-Constructivist Mathematics Model (ACMM) consisting of four interconnected stages: Launch, Explore, Discuss, Reflect, while also maintaining an Affective Safety Core that fosters trust, tolerance for errors, and active engagement. The ACMM serves as a guide for teachers to provide them with practical tips to minimize the fear of mathematics and increase their confidence, participation, and conceptual understanding in tight-budget classrooms by covering the three aspects of the student's experience (emotional, cognitive, and social). The model needs to be tested in intervention studies in different educational settings to ensure its effectiveness and adaptability, as well as the results of the present study.

Reference

- Arslan, H., Tunçer, K., Helmane, I., Bologa, L., Zajac, A., Micheli, E., & Diana, B. A Modular Teaching Program to Alleviate Math Anxiety in Primary Education. DOI: 10.17148/IARJSET.2024.111240
- Corbeil, J. R., Khan, B. H., & Corbeil, M. E. (2021). Microlearning in the digital age. Taylor and Francis. doi, 10, 9780367821623
- Cross Francis, D. I., Hong, J., Liu, J., Eker, A., Lloyd, K., Bharaj, P. K., & Jeon, M. (2020). The dominance of blended emotions: A qualitative study of elementary teachers' emotions related to mathematics teaching. *Frontiers in psychology*, 11, 1865.
- D'Souza, P. P. (2025). Theory-Based Interventions to Reduce Math Anxiety and Enhance Achievement. *Naveen International Journal of Multidisciplinary Sciences (NIJMS)*, 2(1), 73-86.
- Elgendy, H. (2020). A Model Based on the Constructive Theory to Reduce Mathematics Anxiety for Elementary School Pupils. *International Journal of Instructional Technology and Educational Studies*, 1(3), 7-10.
- Elliott, S., Bevan, N., & Litchfield, C. (2020). Parents, girls' and Australian football: a constructivist grounded theory for attracting and retaining participation. *Qualitative research in sport, exercise and health*, 12(3), 392-413 <https://doi.org/10.1080/2159676X.2019.1602560>
- Ergan, S. N. (2025). Beyond anxiety: A theoretical inquiry into shame in mathematics education. *Ordu Üniversitesi Sosyal Bilimler Enstitüsü Sosyal Bilimler Araştırmaları Dergisi*, 15(II. International Congress of Integrated Social Research and Interdisciplinary Studies (ISRIS 2025)), 795-801.
- Fatima, S. S., Mahmood, T., Shahzad, M., & Abbas, S. Z. (2025). Factors Affecting the Learning Difficulties in the Subject of Mathematics at Elementary Level. *The Critical Review of Social Sciences Studies*, 3(3), 2495-2513. <https://doi.org/10.59075/j9rj1753>
- García-García, J., Rodríguez-Nieto, C. A., Son, A. L., & Rodríguez Nieto, C. A. (2024). Exploring junior high school students' geometry self-efficacy in solving 3D geometry problems through 5E instructional model intervention: A grounded theory study. *Infinity Journal*, 13(1), 215-232.
- Hughes, D. C. (2024). A Critical-Constructivist Grounded Theory Analysis of Elementary School Counselors, Career Counseling and STEM-Focused Interventions for African American K-5 Students. The Ohio State University.

- Kadonsi, K. (2025). Developing mathematical resilience: Effective strategies to alleviate mathematics anxiety among secondary school students in Kalomo District, Zambia. Unpublished manuscript.
- Kalati, Z., Rostamy-Malkhalife, M., & Behzadi, M. H. (2025). The Effectiveness of Teaching Problem Solving Strategies According to Constructivism Theory on Mathematics Academic Achievement and Attitudes Toward Mathematics in Sixth Grade Elementary School Students. *Iranian Journal of Educational Research*, 4(1), 45-58.
- Ledbetter, J. J. (2020). Can the Curse Be Reversed?: An Action Research Study of the Effect of Constructivist-Aligned Instructional Strategies and Practices on the Mathematical Identity Development of Fifth-Grade Students (Doctoral dissertation, University of South Carolina).
- Li, H., Zhang, M., Hou, S., Huang, B., Xu, C., Li, Z., & Si, J. (2023). Examining the dynamic links among perceived teacher support, mathematics learning engagement, and dimensions of mathematics anxiety in elementary school students: A Four-wave longitudinal study. *Contemporary Educational Psychology*, 75, 102211.
- Lyster, L. (2024). A Grounded Theory Approach to Exploring Foreign Language Reading Anxiety (Master's thesis, Inland Norway University).
- Ma, F., Bao, Y., & Wang, Q. (2026). The effect of perceived teacher support on mathematics anxiety among rural boarding primary school students: Chain mediation of self-efficacy and academic procrastination. *British Journal of Educational Psychology*, 96(2), 522-538.
- Mukherjee, F. (2025). Exploring Teaching Methodologies That Shape Cognitive And Psychological Approaches To Abstract Mathematical Learning <https://doi.org/10.70096/tssr.250305007>
- Öztürk, M., Altun, Z. Ü., Çakır, S., Ekici, D., & İscan, A. N. (2021). Why Do Primary School Students Have Mathematics Anxiety? A Mixed Method Research. *Turkish Journal of Mathematics Education*, 2(3), 84-90.
- Pahmi, S., Priatna, N., Suhendra, S., Martadiputra, B. A. P., & Muhaimin, L. H. (2025). A phenomenological study of mathematics academic anxiety and mathematics pedagogical anxiety in pre-service elementary school teachers. *Indonesian Journal of Science and Mathematics Education*, 8(2), 390-406.
- Pahmi, S., Priatna, N., Suhendra, S., Martadiputra, B. A. P., & Muhaimin, L. H. (2025). A phenomenological study of mathematics academic anxiety and mathematics pedagogical anxiety in pre-service elementary school teachers. *Indonesian Journal of Science and Mathematics Education*, 8(2), 390-406.
- Phan, B. (2026). High School Math Teachers with a Personal Self-Efficacy Model: Grounded Theory Approach. *Journal of Education, Learning, and Management*, 3(1), 95-116.
- Rohati, R., Kusumah, Y. S., & Kusnandi, K. (2023). Exploring students' mathematical reasoning behavior in junior high schools: A grounded theory. *Education Sciences*, 13(3), 252. <https://doi.org/10.3390/educsci13030252>
- Salvador, K., Paetz, A. M., & Tippetts, M. M. (2020). "We All Have a Little More Homework to Do": A Constructivist Grounded Theory of Transformative Learning Processes for Practicing Music Teachers Encountering Social Justice. *Journal of Research in Music Education*, 68(2), 193-215.
- Spann, L. (2025). Teachers' Perceptions About the Use of Concept-Based Pedagogy in the Middle School Math Classroom: A Qualitative Exploratory Case Study (Doctoral dissertation, Trident University International).
- St Omer, S. M., & Chen, S. (2023). Examining the dynamics of mathematics anxiety, perceived cost, and achievement: A control-value theory approach. *Contemporary Educational Psychology*, 73, 102169.
- Subramaniam, G., & Saleh, Z. M. (2024). Development of GeoExplorer: A gamification platform utilizing constructivist approach to alleviate mathematical anxiety. *Semarak International Journal of STEM Education*, 3(1), 1-16.
- Tallman, M. A., & Uscanga, R. (2025). Managing Students' Mathematics Anxiety in the Context of Online Learning Environments. In *Teaching and learning mathematics online* (pp. 223-249). Chapman and Hall/CRC.
- Tallman, M. A., & Uscanga, R. (2025). Managing Students' Mathematics Anxiety in the Context of Online Learning Environments. In *Teaching and learning mathematics online* (pp. 223-249). Chapman and Hall/CRC.
- Tanjung, A. Q., Arifin, S., & Faizah, S. (2024). Mathematics anxiety in primary education: A systematic review of foundations, causes, and interventions. *Jurnal Gantang*, 9(2), 117-134.
- Thompson, P. W. (2020). Constructivism in mathematics education. In *Encyclopedia of mathematics education* (pp. 127-134). Cham: Springer International Publishing. https://link.springer.com/rwe/10.1007/978-3-030-15789-0_31
- Victoria-Delgado, B. (2024). Teaching to the Heart: A Grounded Theory Exploration of Elementary Educators' Journey Toward Teaching Mathematics for Social Justice (Doctoral dissertation, Chapman University).
- Wahyuningrum, E., Sudirman, S., & Rodríguez-Nieto, C. A. (2026). Reconstructing mathematical success in post-pandemic learning environments: An intensive single-case study using grounded theory coding techniques. *Al-Jabar: Jurnal Pendidikan Matematika*, 17(2), 101-124.
- Wielinski, J. R. (2023). Elementary Teachers' Experiences of Implementing Constructivist Math Strategies: A Qualitative Study. <https://digitalcommons.liberty.edu/doctoral/4840>
- Yue, W., Yu, L., & Yang, Y. (2023). The occupational anxiety of teachers caused by China's 'double reduction' policy—a study based on the grounded theory. *Frontiers in Psychology*, 14, 1144565.