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Understanding Mathematical Anxiety in the Indian Scenario: A Focus on Meghalaya and Insights from Educators

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ABSTRACT

Mathematical anxiety (MA) remains a significant psychological barrier to academic achievement globally, yet its dynamics within regional Indian contexts—particularly in marginalized rural areas—remain understudied. This paper investigates the dual nature of mathematical anxiety, distinguishing between facilitative eustress and debilitating distress. Drawing upon the classic Yerkes-Dodson Law and Working Memory Theory, we introduce the Mathematical Anxiety Performance (MAP) Model and its central construct: the psychological threshold where cognitive arousal transitions from performance-enhancing to performance-impairing. To ground this model empirically, the study was conducted to present a qualitative-dominant survey of frontline mathematics educators across 13 rural secondary and higher secondary Ramakrishna Mission (RKM) schools in Meghalaya. The findings indicate that persistent underperformance on national metrics (e.g., the National Achievement Survey) is not indicative of cognitive deficits but is instead driven by systemic, pedagogical, and socio-cultural stressors that lower students' cognitive thresholds. Finally, we align these insights with the progressive, activity-based mandate of the National Education Policy (NEP) 2020, offering an integrated strategic remediation matrix to elevate the psychological threshold and foster mathematical resilience.

KEYWORDS: Mathematical Anxiety, Working Memory, Eustress, Yerkes-Dodson Law, MAP Model, Meghalaya, NEP 2020

INTRODUCTION

Mathematics is embedded in virtually every dimension of human existence and is indispensable for personal and societal development. From household budgeting to global economic modelling, from logical reasoning to technological innovation, mathematics serves as the foundational framework for understanding and navigating the world. In the educational context, teachers bear the primary responsibility of equipping students not only with mathematical competencies but also with the psychological resilience required to engage with the subject constructively. Despite its universal importance, mathematics remains among the most anxiety-inducing academic subjects across educational systems worldwide. A considerable body of literature has documented the prevalence and consequences of mathematical anxiety (MA), a phenomenon that extends well beyond ordinary nervousness to constitute a genuine psychological barrier to learning. Richard son and Suinn (1972) were among the first to formally define mathematical anxiety as "feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems in a wide variety of ordinary life and academic situations". Subsequent scholars have both confirmed and expanded this definition. Tobias (1978) drew public attention to the issue by arguing that mathematical anxiety is not rooted in cognitive deficiency but in psychological conditioning, observing that many individuals who struggle with mathematics possess the intellectual capacity to succeed but are obstructed by deeply internalized fear.

Contradicting the early view that anxiety is inherently debilitating, later researchers

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introduced the concept of eustress, or positive anxiety, as a functionally distinct construct. The Yerkes-Dodson Law, a foundational principle in educational psychology, posits that performance increases with mental arousal up to an optimal threshold, beyond which further arousal results in a decline. This suggests that not all forms of anxiety are harmful; moderate levels of arousal may, in fact, enhance focus and performance. Hembree (1990) confirmed through meta-analysis that while severe MA is associated with poor mathematical performance and avoidance behaviour, its relationship with performance is moderated by intensity, duration, and individual coping mechanisms. Ashcraft (2002), however, offered an important counter-perspective, demonstrating that even moderate levels of MA can impair working memory capacity, thereby degrading performance on complex mathematical tasks irrespective of the student's underlying ability. This tension between the motivating potential of mild anxiety and the debilitating effect of elevated anxiety remains a central issue in contemporary literature. Ma (1999), in a comprehensive meta-analysis, confirmed a significant negative relationship between mathematical anxiety and mathematics achievement, while simultaneously noting that this relationship is influenced by contextual variables including grade level, gender, and instructional environment. More recently, Karimi and Venkatesan (2018) found that academic hardiness moderated the impact of MA on performance among Indian high school students, implying that interventions targeting psychological resilience may be as important as content-focused remediation. These findings collectively suggest that mathematical anxiety cannot be meaningfully addressed through pedagogical reform alone; systemic, psychological, and socio-cultural factors must also be considered. Within the Indian educational context, mathematical anxiety assumes salience given the high-stakes nature of the subject in academic progression and career pathways. Despite a rich mathematical heritage, Indian students across diverse socio-economic and geographical strata consistently exhibit anxiety-related barriers to mathematical engagement. The state of Meghalaya presents a compelling regional case study. According to assessments including the National Achievement Survey (NAS), students in Meghalaya frequently perform below the national average in mathematics. Yet educators in the region consistently report that this underperformance cannot be attributed to a lack of cognitive potential, but rather to psychological, pedagogical, and systemic factors that have been insufficiently addressed by existing policy frameworks.

The present study therefore seeks to: (i) distinguish between negative and positive forms of mathematical anxiety and their respective effects on student performance; (ii) introduce the concept of a psychological threshold at which eustress transitions into debilitating distress; (iii) examine the specific manifestations and causes of mathematical anxiety within the Meghalaya context through educator insights; and (iv) propose an integrated framework, the Mathematical Anxiety Performance (MAP) Model, to guide future pedagogical and policy interventions. This paper further situates its findings within the broader aspirations of the National Education Policy (NEP) 2020 and its implications for reimagining mathematics education in India.

Theoretical Framework Anxiety: Conceptual Overview

Anxiety is a psychological and physiological state characterized by feelings of worry, nervousness, or unease, typically arising in response to a perceived threat or challenge, whether real or imagined. Anxiety can trigger physical symptoms including increased heart rate, sweating, and muscle tension, as well as cognitive effects such as difficulty concentrating or racing thoughts. In educational contexts, anxiety assumes heightened significance due to its direct interaction with academic performance and student well-being.

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Anxiety may be broadly classified into two functionally distinct forms:

i. Negative Anxiety (Distress): Occurs when anxiety becomes overwhelming, persistent, or disproportionate to the situation, leading to impaired cognitive functioning and systematic avoidance of the anxiety-inducing stimulus.

ii. Positive Anxiety (Eustress): Produces beneficial effects on motivation, performance, and emotional well-being. A moderate level of anxiety can induce alertness, focus, and readiness to respond to challenges, which may improve performance in high-pressure situations, thereby serving as a catalyst for growth. The Yerkes-Dodson Law provides the classical theoretical basis for this distinction, illustrating that performance increases with physiological or mental arousal, but only up to a specific point, beyond which further arousal becomes counterproductive (Figure 1). Anxiety, therefore, is a complex and context-dependent emotion whose impact is determined by its duration, intensity, and the individual's capacity to manage it.

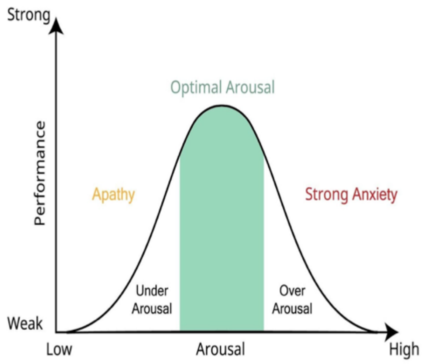

Figure 1: The Yerkes-Dodson Law illustrates the relationship between arousal levels and performance efficiency, distinguishing zones of under-arousal, optimal arousal, and over-arousal/strong anxiety.

Mathematical Anxiety: Definition and Dual Nature

Mathematical Anxiety (MA) is not a reflection of a student's mathematical ability but rather a psychological barrier that prevents them from performing to their full potential. Early conceptualizations treated MA as exclusively negative; however, contemporary scholarship recognizes a dual nature that encompasses both negative and positive forms.

Richardson and Suinn (1972) defined MA as "feelings of tension and anxiety that interfere with the manipulation of numbers and the solving of mathematical problems". Tobias (1978) emphasized its psychological rather than cognitive origin. Ashcraft (2002) defined it as "a feeling of tension, apprehension, or fear that interferes with math performance" and demonstrated that it reduces working memory capacity. Ma (1999) described it as "a state of discomfort associated with performing mathematical tasks", while Hembree (1990) characterized it as "an effective response to mathematics that involves fear, stress, and apprehension".To illustrate the dual nature of MA concretely, consider three students - Nikhil, Nishant, and Neelam in the same class preparing for a mathematics test. Nikhil, who dislikes the subject, experiences intense nervousness and physical symptoms such as a stomachache; upon receiving the question paper, he blanks out entirely and is unable to write. Neelam, whose favourite subject is mathematics, approaches the test with calm confidence, answers all questions thoroughly, and performs excellently. Nishant, equally enthusiastic but overconfident, becomes excessively excited, makes careless errors, forgets formulas, and underperforms relative to his ability - though he subsequently reflects on and corrects his mistakes. This scenario Figure 1 illustrates that mathematical anxiety encompasses a spectrum ranging from paralyzing fear (Nikhil) through optimal alertness (Neelam) to counterproductive overexcitement (Nishant). As the Bhagavad Gita counsels: कर्मण्येवाधिकारस्ते माफलेषु कदाचन - one has the right to perform one's actions, but not to the fruits thereof. This philosophy captures the essence of managing anxiety: focusing on process rather than outcome. This psychological distinction resonates with the ancient wisdom of the Bhagavad Gita (Chapter 2, Verse 47), which counsels' detachment from outcomes - a mindset that, if cultivated, could itself serve as a buffer against performance-driven anxiety (Figure 4).

Negative Mathematical Anxiety

Negative Mathematical Anxiety may be defined as the emotional response that arises when an individual is confronted with mathematical tasks, characterized by intense feelings of fear, tension, and apprehension that systematically interfere with effective mathematical performance. Its principal characteristics include Cognitive overload, wherein anxiety exhausts working memory resources, leading to poor performance even when the student possesses the requisite skills (Ashcraft, 2002). Avoidance behavior, including skipping classes, neglecting homework, and selecting academic or career pathways that minimize mathematical engagement.

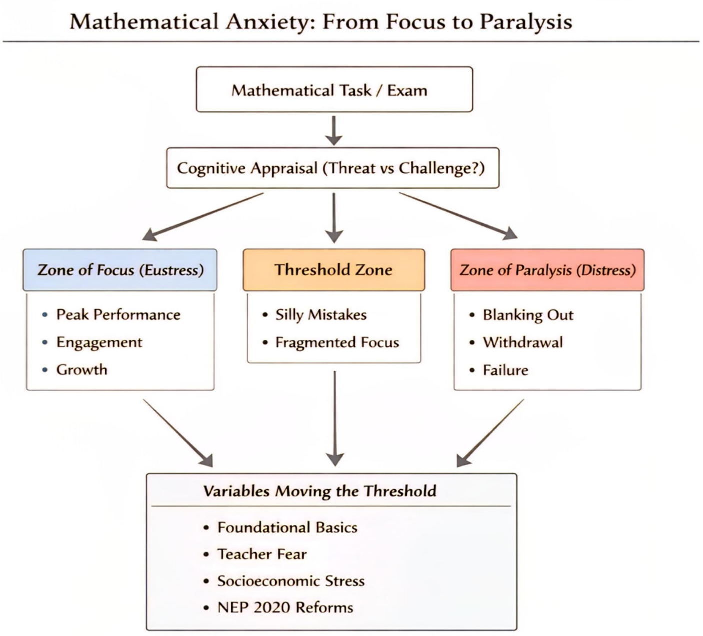

Figure 2: Conceptual model of Mathematical Anxiety pathways from focus to paralysis. Note: This figure illustrates the conceptual framework mapping student cognitive appraisals (eustress vs. distress) and the theoretical variables that modulate the psychological threshold, serving as a heuristic guide for future empirical testing

Physical manifestations such as sweating, increased heart rate, nausea, and in severe cases, panic attacks. Progressive erosion of self-confidence, creating a self-reinforcing cycle of failure and withdrawal. Long-term academic stress that impairs performance across multiple subjects.

Positive Mathematical Anxiety

Positive Mathematical Anxiety may be defined as a state of heightened alertness, motivation, and focus that arises in response to challenging mathematical tasks. Rather than impairing performance, it propels students toward thorough preparation and sustained effort. Its key characteristics include:

Motivational drive: It encourages students to study rigorously, seek assistance proactively, and persist through difficulty. Sharpened concentration: It enhances focus and attentional allocation during problem-solving.

Resilience and growth: It promotes perseverance, leading to increased confidence and expanded mathematical self-efficacy.

It should be noted, however, that excessive positive anxiety may tip into overconfidence, as illustrated by Nishant, resulting in careless errors. Positive mathematical anxiety is, therefore, optimally beneficial when maintained within a moderate range.

Probable Causes of Mathematical Anxiety in the Indian Scenario

Mathematical anxiety is a globally recognized educational phenomenon; however, its intensity and manifestation are shaped by contextual and systemic factors unique to each educational setting. In the Indian scenario, MA emerges from a complex interaction of cognitive, pedagogical, socio-cultural, and economic influences.

Cognitive and Learner-Related Factors

At the individual level, low self-confidence and weak conceptual foundations are among the most prevalent causes of MA. In India, where mathematics is widely perceived as a high-stakes subject crucial for academic progression and career opportunities, students who struggle with foundational concepts experience heightened fear of failure. The cumulative and hierarchical nature of mathematics amplifies this problem, as early conceptual gaps persist and compound across higher grades. Poor concentration, often exacerbated by large class sizes and limited individualized attention, further hinders mathematical comprehension. Rote-based learning approaches which emphasize procedural memorization over conceptual understanding restrict adaptive problem-solving and increase anxiety during examinations.

Pedagogical and Teacher-Related Factors

Teachers occupy a central role in shaping students' affective and cognitive relationships with mathematics. In the Indian context, variations in pedagogical training, classroom practices, and institutional cultures significantly influence learning outcomes. Mismatch between classroom instruction and homework difficulty wherein simpler problems are demonstrated in class while more complex tasks are assigned without scaffolding contributes to student frustration and self-doubt. The quality of the teacher-student relationship also plays a critical role: supportive nd encouraging teachers can substantially mitigate MA, whereas dismissive or authoritarian approaches may intensify avoidance behaviour. The prevalence of private tuition culture in India further stratifies learning opportunities. Students who cannot afford supplementary coaching may receive less individualized instruction, contributing to performance gaps, diminished self-esteem, and heightened anxiety.

Family and Home Environment Factors

Family background significantly mediates students' mathematical experiences. Limited parental involvement - frequently a consequence of occupational demands restricts the academic guidance available at home. Moreover, parents who themselves experience MA may unconsciously transmit negative mathematical attitudes to their children, perpetuating intergenerational cycles of anxiety. Conversely, excessive parental pressure for high academic achievement, particularly common in competitive Indian households, may similarly heighten MA.

Socio-Economic Influences

Socio-economic disparities are particularly pronounced in the Indian educational landscape. Students from economically disadvantaged backgrounds often face financial stress, constrained access to learning resources, and unstable home environments all of which negatively affect cognitive functions including attention, memory, and problem-solving capacity. In some communities, school attendance is motivated primarily by welfare programmes (such as the Midday Meal Scheme) rather than academic aspiration, which may reduce engagement with mathematically demanding subjects.

Classroom, Social, and Cultural Factors

The examination-oriented culture prevalent in Indian classrooms characterized by ranking, performance pressure, and public evaluation intensifies MA, particularly in a subject where errors are highly visible. Societal stereotypes, including the persistent belief that boys possess an inherent advantage in mathematics, negatively affect the self-perception and mathematical confidence of female students, discouraging participation and reinforcing anxiety despite equal cognitive potential.

Systemic and Policy-Level Factors

At the systemic level, gaps in teacher training and professional development, inequitable distribution of educational resources, and assessment frameworks that prioritize summative over formative evaluation contribute to MA. While the National Education Policy (NEP) 2020 explicitly emphasizes conceptual understanding, experiential learning, and reduced rote memorization, effective and uniform implementation across diverse regional contexts remains a significant challenge.

The Psychological Threshold

The "Threshold" represents the critical psychological and physiological tipping point at which Positive Mathematical Anxiety (eustress) transitions into Negative Mathematical Anxiety (distress). Drawing upon the Yerkes-Dodson Law, the threshold is the point on the arousal-performance curve at which additional anxiety ceases to be facilitative and begins to impair cognitive functioning. The psychological threshold is operationally defined using the Working Memory Theory, which posits that human beings have a cognitive system with a limited capacity responsible for temporarily holding and manipulating information necessary for complex tasks such as reasoning, comprehension, and learning. Think of working memory as the "mental workspace" or RAM of your brain. It can only hold a few pieces of information at once. When a student solves a math problem, their working memory is actively managing numbers, recalling formulas, and processing steps all at the same time.

According to this theory, the psychological/cognitive threshold is defined as the exact point where a student's limited working memory capacity becomes completely overwhelmed. It can be expressed through a simple cognitive balance equation:

Threshold = Available Working Memory Capacity - (Task Cognitive Load + Anxiety-Induced Intrusive Thoughts)

The three student archetypes introduced earlier map directly onto positions relative to this threshold framework:

Below the Threshold (Optimal Performance): When a student is focused and experiences mild excitement or alert readiness (eustress), their working memory is entirely dedicated to the math task itself. Neelam represents the optimal zone.

At the Threshold (The Tipping Point): As anxiety increases, the brain begins to generate intrusive, negative thoughts ("I'm going to fail", "I'm not smart enough"). These thoughts start competing with the math problem for space in the working memory. The student begins making careless, silly mistakes because their mental workspace is getting crowded. Nishant illustrates the threshold zone. Beyond the Threshold (Cognitive Paralysis): The threshold is officially crossed when the anxiety-driven thoughts and physical panic consume so much working memory space that there are virtually no cognitive resources left to process the actual mathematics. Even if the student is entirely capable of solving the problem, their mental workspace is completely hijacked by fear, leading to "blanking out" or total performance paralysis. Nikhil represents the paralyzing zone. Ashcraft (2002) provides the neuropsychological basis for this model, demonstrating that anxiety-related intrusive thoughts occupy working memory capacity that would otherwise be available for mathematical computation. The threshold is therefore operationally defined as: The point at which anxiety-related cognitions (fear of failure, negative self-evaluation) consume a greater proportion of working memory than the mathematical task itself, rendering effective performance impossible.

Mathematical Anxiety in Meghalaya: Insights from Educators

The state of Meghalaya presents a distinctive regional context for examining mathematical anxiety. According to multiple assessments including the National Achievement Survey (NAS), students in Meghalaya frequently perform below the national average in mathematics, and a substantial proportion fail to meet expected grade-level competency benchmarks. Concurrent government education policies have, in several respects, inadequately supported the genuine learning outcomes required in the subject.

Crucially, educators throughout the state consistently assert that this pattern of underperformance does not reflect an inherent cognitive deficit in Meghalaya students. Rather, multiple intersecting external factors pedagogical, systemic, socio-economic, and psychological conspire to generate elevated and persistent mathematical anxiety. The following analysis draws upon qualitative insights gathered from mathematics teachers across 13 Ramakrishna Mission schools in the state.

METHODOLOGY

Study Design and Rationalized Institutional Selection

The present investigation adopts an exploratory descriptive survey design with a qualitative-dominant approach. This methodology is specifically selected to investigate the systemic, environmental, and affective dimensions of mathematical anxiety through the expert lens of frontline educators. Rather than executing a broad, non-specific macro-survey across well-resourced urban centres, this study purposefully deploys an intensive regional focus on the Ramakrishna Mission (RKM) school network. In Meghalaya, a stark educational divide exists between urban centres like Shillong, which benefit from concentrated institutional infrastructure, robust learning resources, and stable pedagogical environments and remote rural sectors characterized by unique systemic vulnerabilities. RKM schools serve as a critical educational lifeline in these underserved rural regions. While the RKM network spans numerous primary and exploratory learning centres throughout the state, this study purposefully isolates institutions operating strictly at the Secondary and Higher Secondary school levels. This specific institutional constraint was established because formal mathematical anxieties, abstract problem-solving demands, and high-stakes evaluative pressures peak during these specific developmental years. This targeted institutional focus narrowed the eligible pool to 13 core regional schools:

RKM Secondary School, Ladmawphlang
RKM Secondary School, Laitlyngkot
RKM Higher Secondary School, Nartiang
RKM Higher Secondary School, Nongwar
RKM Higher Secondary School, Shella
Ramakrishna Mission, Sohra
RKM Secondary School, Kalibari
RKM Secondary School, Swer
RKM Secondary School, Laitlyndop
RKM UP School, Nongkynrih
RKM Higher Secondary School, Mylliem
Ramakrishna Mission, Mawmluh
RKM Higher Secondary School, Sohbar

Participant Characteristics

The sample consists of 15 frontline mathematics educators dedicated to these targeted regional institutions. While the resulting numerical sample size of teachers is bounded, the cohort represents an exhaustive, targeted capture of secondary-level mathematics faculty across these rural networks. Among the participants, 13 provided full demographic profiles, revealing an age distribution ranging from 24 to 52 years, a gender composition of 10 male and 3 female instructors, and professional instructional expertise spanning from 1 to 22 years; the remaining 2 educators participated anonymously, leaving their specific names, genders, and ages unrecorded.

The methodological decision to gather data primarily from educators rather than directly from students is a deliberate strategy designed to capture a consolidated, high-fidelity diagnostic view of student anxiety. Frontline mathematics teachers in rural settings do not merely observe single exam outcomes; they function as experienced, long-term expert informants. Their professional perspectives represent a synthesized accumulation of daily classroom interactions, student behavioural patterns, localized parental dynamics, and continuous diagnostic assessments. By tapping into this aggregated educator experience, the study bypasses the immediate performance biases or transient test-day panic that often skews direct student surveys, yielding instead a robust structural overview of how mathematical anxiety manifests continuously in rural environments.

Data Collection

Data were collected through structured questionnaires and semi-structured interviews designed to triangulate the systemic triggers, observable behaviours, and threshold variables modulating student anxiety.

RESULTS

Survey Findings

Analysis of the survey data yielded the following key findings across three thematic domains:

Causes of Mathematical Anxiety Identified by Educators:

Weak foundational knowledge: 70% of educators identified this as a primary contributing factor.Lack of parental support: Cited by 60% of respondents.Gender stereotypes in mathematics: Noted by 45% of educators.

Common Student Responses to Mathematical Anxiety:

Fear of failure: Reported by 85% of educators as the dominant student response. Avoidance of mathematics: Observed by 65% of respondents. Performance pressure: Noted by 50% of educators.

Recommended Interventions:

Use of innovative and varied teaching aids: Endorsed by 75% of educators. Reformed and formative assessment methods: Recommended by 80% of respondents. Greater parent-teacher collaboration: Advocated by 65% of educators.

Educator Voices

Qualitative analysis of educator interviews revealed consistent and substantive concerns regarding structural barriers to mathematical learning in Meghalaya. Educators highlighted challenges including overcrowded classrooms, inadequate infrastructural facilities, salary disparities between institutional categories, and insufficient opportunities for professional development as significant impediments to effective mathematics teaching.

A recurrent theme in educator accounts was the role of conditioned belief systems in generating and sustaining mathematical anxiety. As one educator observed, “the biggest challenge is not the students’ ability, but their mindset. They have been conditioned to believe that mathematics is difficult, and this belief becomes a self-fulfilling prophecy”. Such observations align closely with Ashcraft’s (2002) account of how anxiety-driven intrusive thoughts displace mathematical cognition from working memory.

Threshold Factors: Research Evidence

Based upon the integrated analysis of survey data and qualitative insights, the following factors were identified as those that systematically lower the psychological threshold, rendering students more vulnerable to crossing from eustress into debilitating distress:

Weak Foundational Knowledge (70%): The absence of basic conceptual competence means that even modest task demands can trigger the threat response, consistent with Ashcraft’s (2002) account of MA’s impact on working memory.

Environmental Stressors: Overcrowded classrooms and the absence of individualized support reduce students’ cognitive buffering capacity against anxiety.

Socioeconomic Pressure: Chronic baseline stress arising from economic disadvantage lowers the threshold for academic anxiety, leaving fewer cognitive resources available for mathematical engagement.

Fixed Mindset: Educators noted that students conditioned to regard mathematics as inherently inaccessible experience threshold collapse at the earliest sign of difficulty, consistent with Dweck’s (2006) growth mindset framework.

Mathematical Anxiety Performance (MAP) Model: A Cognitive-Behavioural Framework

Building upon the exploratory findings obtained from the rural Meghalaya RKM school network and the cognitive-threshold perspective developed in this study, a Mathematical Anxiety Performance (MAP) Model is proposed as a conceptual framework for explaining the relationship between anxiety and mathematical performance. Positioned prior to the broader discussion of regional educational dynamics, the model provides a foundational structure for understanding how systemic and psychological factors translate into observable student behaviours and academic outcomes. The MAP Model conceptualizes mathematical performance as a function of cognitive arousal and identifies three distinct operational zones along an anxiety-performance continuum (Figure 3).

Engagement Zone (Eustress)

The Engagement Zone represents an optimal level of psychological arousal where students experience productive stress that enhances concentration, motivation, and mathematical engagement. Within this zone, anxiety functions as a facilitating factor rather than an impediment, enabling students to remain focused and resilient when confronted with mathematical challenges. Students operating in this area demonstrate behavioural characteristics like the Neelam archetype, effectively transforming moderate stress into sustained academic effort and successful task execution.

Warning Zone (Cognitive Threshold)

The Warning Zone is situated at or near the critical cognitive threshold where levels of arousal begin to compromise performance. Although students in this zone retain the capacity to solve mathematical problems, their cognitive stability becomes increasingly fragile. Consistent with the Nishant archetype, these learners are susceptible to concentration lapses, excessive excitement, procedural inaccuracies, and avoidable mistakes. Performance remains possible, but the probability of error increases substantially due to the growing burden on working memory resources.

Paralysis Zone (Distress)

The Paralysis Zone reflects a state of severe mathematical anxiety in which cognitive and emotional demands exceed an individual's coping capacity. At this stage, working memory resources become overwhelmed, resulting in marked cognitive impairment. Students exhibit behaviours represented by the Nikhil archetype, including task avoidance, mental shutdown, inability to retrieve previously learned knowledge, and failure to execute mathematical procedures despite possessing the underlying intellectual capability to do so.

Dynamic Nature of the Cognitive Threshold

A central proposition of the MAP Model is that the cognitive threshold is not fixed but is continuously influenced by environmental, academic, and psychosocial factors. Evidence from educator survey responses indicates that several structural liabilities operate as negative vectors that lower the threshold at which anxiety begins to impair performance. These include foundational mathematical deficiencies (reported by 70% of educators), environmental and school-related stressors, localized socioeconomic pressures, and entrenched fixed-mindset beliefs regarding mathematical ability. Conversely, the MAP Model incorporates targeted intervention mechanisms designed to strengthen coping capacity, protect working memory resources, and elevate the cognitive threshold. Such interventions aim to reduce the adverse effects of mathematical anxiety and facilitate the systematic movement of students back toward the Engagement Zone, where optimal learning and performance are most likely to occur.

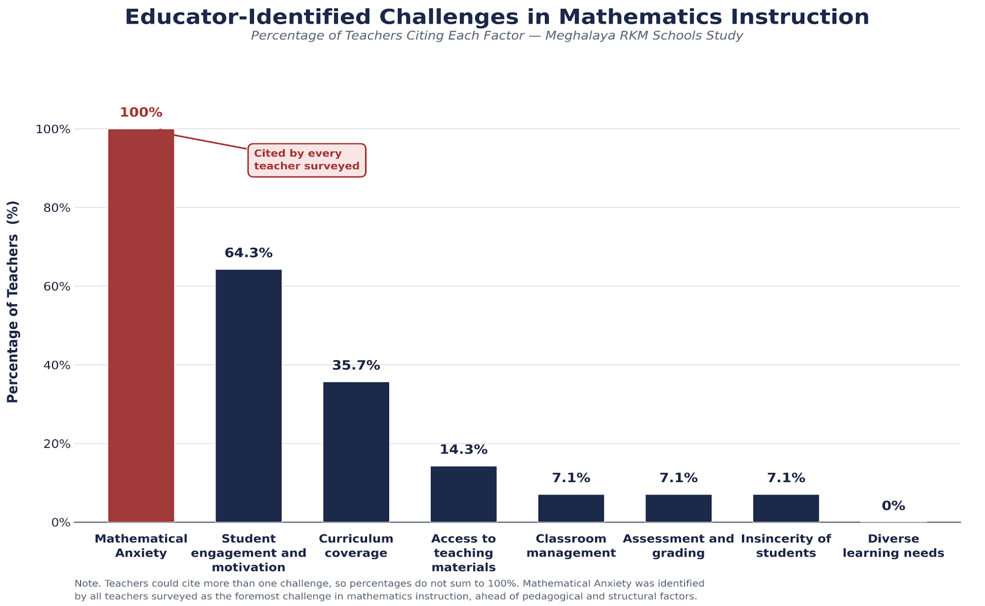

Figure 3: Survey results from regional educators highlighting the percentage distribution of the biggest instructional and structural challenges faced within the mathematics classroom

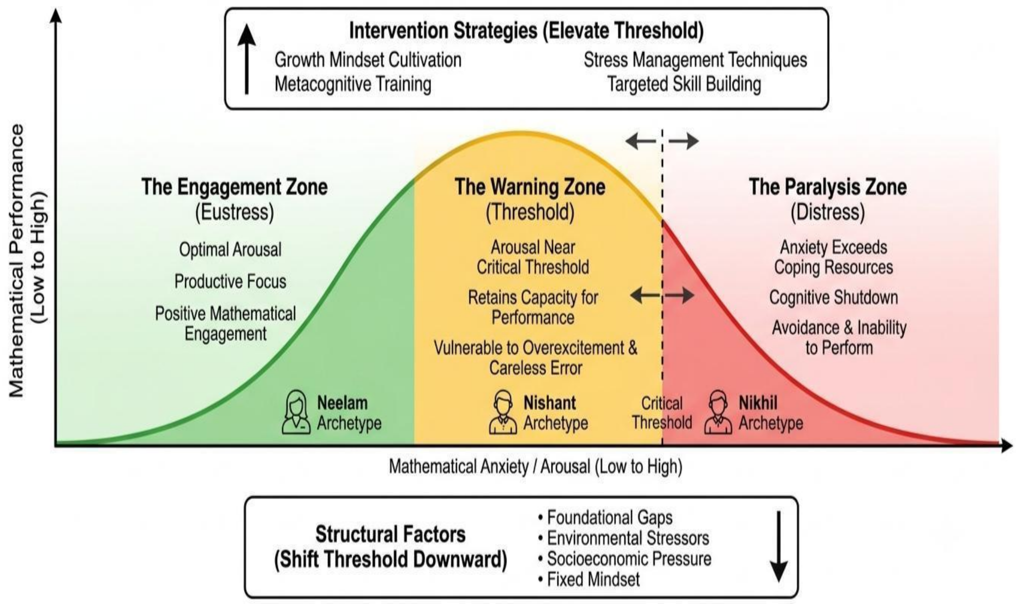

Figure 4: The Mathematical Anxiety Performance (MAP) Model mapping student behavioural archetypes (Neelam, Nishant, and Nikhil) along the cognitive threshold of the mathematical anxiety-arousal curve.

DISCUSSION The qualitative-dominant findings gathered from frontline educators in rural Meghalaya highlight that student underperformance on macro-metrics such as the National Achievement Survey (NAS) is fundamentally an affective and structural problem rather than an inherent cognitive deficit. When the MAP model is applied to these field realities, it becomes clear that rural students frequently experience threshold collapse at a much earlier stage of mathematical engagement than their urban counterparts.The systemic lack of foundational mathematical knowledge, cited by 70% of the surveyed teachers, means that even routine secondary-level problem solving is appraised by the student as an overwhelming threat rather than a manageable challenge. When this baseline conceptual vulnerability is compounded by remote environmental constraints such as overcrowded classrooms, limited visual teaching aids, and minimal parental academic support, the cognitive space required to buffer anxiety is severely depleted. This baseline distress systematically hijacks working memory capacity, causing students to cross the psychological threshold into the Paralysis Zone before they can even apply their actual cognitive potential to a task. Addressing this regional anxiety cycle requires transitioning away from content-heavy, high-stakes evaluative methodologies toward low-stakes, formative frameworks that actively protect the student's affective state. To bridge the gap between structural policy and classroom realities, this study proposes below in tabular form, an integrated framework of action across pedagogical, psychological, environmental, and policy dimensions:

Pedagogical & Confidence Building	Environmental Support	Practice & Mindset
Remedial classes & structured logical progression from simpler to highly complex tasks.	Cultivate a warm, positive classroom attitude; actively reduce stigma associated with errors.	Integrate additional scaffolded support during available instructional periods.
Use concrete visual models, tactile aids, and localized physical representations.	Initiate early, accessible mathematical problems to build confidence & intrinsic motivation.	Encourage daily conceptual clarification & continuous professional teacher development.

This strategic framework directly aligns with the National Education Policy (NEP) 2020, which offers a critical structural lever to elevate the psychological threshold. By replacing rote memorization with activity-based exploration, mathematical games, and experiential learning, the policy reduces the threat valence associated with errors. When a classroom culture actively normalizes mistakes as essential diagnostic steps in the learning process, the student's threshold for paralysis rises, enabling extended, constructive performance within the Engagement Zone. While this study offers valuable insights into the affective landscape of regional mathematics education, certain contextual boundaries must be explicitly acknowledged:

Indirect Nature of Student Metrics: Because the diagnostic data is derived from the expert viewpoints of educators, the student performance and psychological indicators are interpreted through an instructional lens rather than measured directly from the student cohort. Future empirical investigations should aim to pair these educator reflections with direct student psychometric profiling.

Sample Size and Geographic Scope: The sample is explicitly drawn from 13 specific secondary-level RKM schools operating within rural terrains. Consequently, the statistical sample size remains naturally bounded, and the findings cannot be generalized to well-resourced urban settings, such as downtown Shillong, where educational infrastructures differ dramatically. However, this sample serves as a highly targeted, ecologically valid representation of the rural-educational realities it intended to isolate.

CONCLUSIONS

This study demonstrates that mathematical anxiety is a dynamic, context-dependent barrier rather than an immutable cognitive limitation. By introducing the dual-nature concept of anxiety and the psychological threshold framework through the MAP Model, this paper provides a field-valid, actionable lens to evaluate student performance in vulnerable educational landscapes. While the present work introduces the MAP model as a conceptual framework meant to guide future empirical research, it highlights the urgent need for localized, qualitative realities to inform macro-level educational policies. Successful implementation of the experiential mandates of NEP 2020 supported by equitable systemic resource distribution to rural sectors holds the potential to eliminate performance paralysis and foster genuine mathematical confidence across diverse student demographics.

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CONFLICT OF INTEREST:

The author declares no conflict of interest.

ETHICS STATEMENT:

This study was conducted in accordance with ethical principles for social science research. Participation was voluntary, and data were collected with the informed consent of all participants.

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