Not Anxious or Confident: A Framework of Why Mathematics Apathy is a Barrier for Learning

Jamie Smith

University of Lincoln, United Kingdom

Abstract

Mathematics anxiety has been widely studied as a barrier to learning and achievement [1], yet mathematics apathy, characterised by low perceived value and low perceived control, remains underexplored despite its significant impact on student engagement and achievement [2]. This paper introduces a theoretical framework situating mathematics apathy within the Control-Value Theory of Achievement Emotions [3] underpinned by principles of Social Cognitive Theory [4]. Drawing on longitudinal survey data from over 1,200 UK secondary students, this study traces how mathematics apathy develops over time.

This paper argues that mathematics apathy warrants recognition as a distinct emotional barrier with unique implications for learning. Unlike mathematics anxiety, which is activating and often distressing, mathematics apathy is deactivating: it reduces effort, persistence, and willingness to engage with challenge. This paper invites dialogue on how teacher preparation and mentality can address mathematics apathy in their students, as a systemic barrier to mathematics education.

Keywords: *Mathematics apathy; Mathematics anxiety; Avoidance behaviours; Control value theory; Teacher resilience; Professional learning; Student Mentality*

1. Introduction

For decades, mathematics anxiety has dominated discourse on emotional barriers to mathematics learning. Its effects on avoidance, performance, and long-term participation are well documented [2][5][6][7]. Yet an equally pervasive phenomenon, mathematics apathy, has received far less attention. Mathematics apathy is not simply a lack of interest; it is similarly an achievement emotion shaped by students' perceptions of control and value [3]. When students believe they have little influence over their success and see limited relevance in the subject, apathy emerges as a protective disengagement strategy.

This paper argues that mathematics apathy warrants recognition as a distinct emotional barrier with unique implications for learning. Unlike anxiety, which is activating and often distressing, apathy is deactivating: it reduces effort, persistence, and willingness to engage with challenge. In classrooms, apathetic students may appear compliant yet disconnected, completing tasks without cognitive investment. Such disengagement is particularly concerning in mathematics, where conceptual understanding requires sustained attention and iterative reasoning.

Across the mathematics education literature, mathematics anxiety and mathematics confidence are frequently presented as opposing ends of a single affective continuum [8][9][10]. These early works demonstrated strong inverse relationships between confidence and anxiety in mathematics, a pattern later reinforced by a meta-analysis showing that higher mathematics confidence is consistently associated with lower mathematics anxiety [7]. Subsequent studies [6][11] have continued to treat the two constructs as conceptual dipoles linking low self-efficacy to heightened anxiety in mathematics contexts. While this one-dimensional framing has been valuable for understanding the interplay between confidence and anxiety, it does not fully account for the broader emotional landscape of mathematics learning. When examined through the lens of control value theory, the relationship between confidence and anxiety becomes part of a wider two-dimensional space in which perceived control and perceived value interact. This shift from a single continuum to a two-axis framework reveals additional emotional profiles beyond the traditional mathematics confidence mathematics anxiety dipole, including the low control, low value state that forms the basis of the construct I propose in this study: mathematics apathy.

2. Theoretical Framework

Pekrun's [3] control value theory (CVT) provides a powerful lens for understanding mathematics apathy. CVT proposes that achievement emotions stem from two appraisals: perceived control over learning and perceived value of the task or domain. Different combinations of these appraisals give rise to distinct emotional patterns. High control and high value appraisals generate positive activating emotions such as enjoyment or pride. Low control and high value appraisals often produce anxiety and nervousness. Low value and low control, however, generate deactivating emotions such as boredom, hopelessness, or apathy.

Within this framework, control and value are understood to develop together over time. Students' academic emotions emerge from the interaction of their control beliefs and value beliefs, meaning that the emotions they experience during a learning activity depend on how capable they feel and how much the task matters to them. CVT therefore provides a coherent structure for examining the emotional landscape of mathematics learning.

Through the control-value framework, mathematics anxiety is hypothesised to develop when a student experiences low control in a mathematics activity when they also experiencing a higher value appraisal towards mathematics [12]. Students who place strong importance on mathematics but feel unable to succeed are consistently found to report the highest levels of anxiety [12][13]. Low control in this context is closely associated with lowest levels of self-belief combining lower levels of perceived competence in tackling specific academic tasks (self-efficacy) and their general belief in being a 'good mathematician' (self-confidence). Using this framework of control-value theory and its application to mathematics anxiety a profile (see Figure 1) can be built showing the location of mathematics anxiety and three interconnected mathematics achievement emotions.

3. Defining Mathematics Anxiety

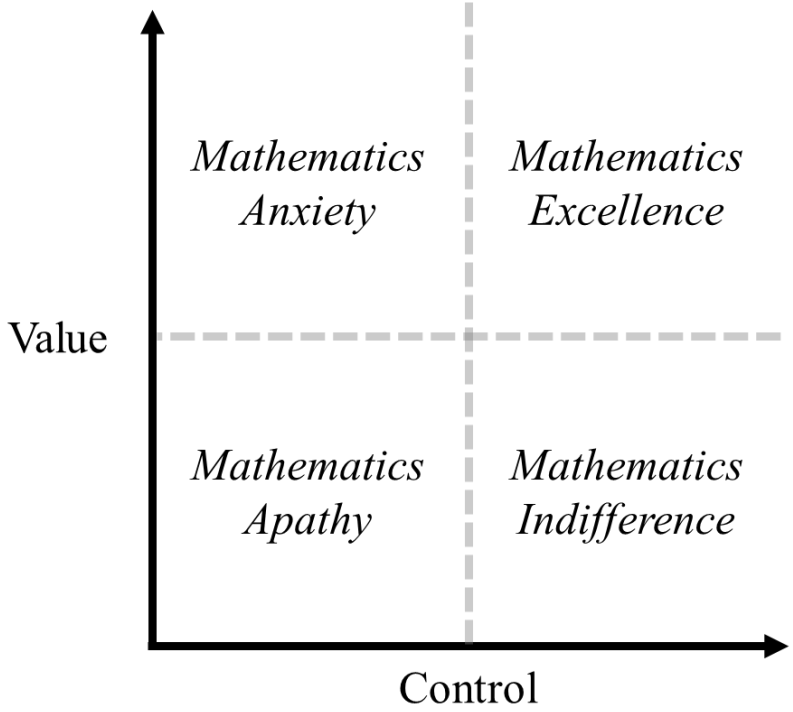

Fig. 1. Control-Value Theory Profile of Mathematics Achievement Emotions

Note. An original conceptual framework illustrating four distinct emotional responses to mathematics derived on Pekrun's [3] control-value theory: mathematics excellence (high value, high control), mathematics anxiety (high value, low control), mathematics indifference (low value, high control), and mathematics apathy (low value, low control).

Most notable is the lower left corner of the matrix corresponding to students with low levels of control and value. These students generally feel less competent (having little control over mathematics) nor invested in mathematics (attributing little value to mathematics), leading to disengagement and emotional detachment. Control-value theory [3] predicts that when both perceived control and task value are low, students experience deactivating negative emotions. Therefore, and building on this framework, for students with low control and task value I propose the term mathematics apathy, defined originally here as:

> "A motivational deficit in which learners neither value nor expect success in mathematics – often connected to mathematics anxiety, mathematics apathy is underpinned by a lack of self-confidence and self-efficacy."

Zones of proximal development [14] offers a useful lens for understanding the emergence of mathematics apathy. When classroom tasks fall substantially below a learner's developmental level, they fail to generate cognitive challenge, resulting in limited motivation to participate or improve. Conversely, when tasks sit persistently beyond a student's perceived capability, they reinforce feelings of inadequacy and disengagement. In both cases, the misalignment between task demand and learner readiness contributes to a deactivation of effort.

Social cognitive theory [4][15] further illuminates this dynamic. Low self-efficacy diminishes students' willingness to attempt mathematical tasks, while the absence of perceived value erodes any incentive to persist when difficulties arise. Apathy, therefore, can be understood as the product of a dual erosion: students feel neither capable of success nor convinced that success matters. This combination aligns closely with the low control, low value quadrant of [3] control value theory, positioning apathy as a theoretically distinct emotional state rather than a simple lack of motivation.

As curricular complexity increases, repeated experiences of low control, such as difficulty with foundational concepts, and low value, such as limited real-world applications compound over time, reinforcing patterns of disengagement. These experiences shape the student's mathematics mentality: their combined beliefs, emotions, and expectations that frames their relationship with the mathematics. Crucially, mathematics apathy does not always manifest as overt resistance. Many apathetic students maintain behavioural compliance while disengaging cognitively, completing tasks with minimal investment. This quiet disengagement makes apathy difficult for teachers to detect and easy for systems to overlook. Its subtlety underscores the need for teacher education programmes to address apathy explicitly as a distinct emotional barrier, equipping teachers to recognise its signs and respond with pedagogical strategies that rebuild both perceived control and perceived value.

4. Empirical Evidence

Although the present paper is theoretical in focus, illustrative evidence from a longitudinal study [18] of UK secondary students provides empirical plausibility for the proposed construct of mathematics apathy. The dataset, drawn from three secondary schools and comprising matched responses from 1,246 students aged 11–14, offers insight into how students' emotional profiles in mathematics evolve over time and how these trajectories align with the low control, low value quadrant predicted by Control Value Theory.

Two waves of data collection were conducted during the school year, with 1,545 students participating in Phase A and 1,560 in Phase B, yielding the 1,246 matched cases used for longitudinal analysis. Students completed validated measures of mathematics anxiety and mathematics confidence. Mathematics anxiety was assessed using the Modified Abbreviated Math Anxiety Scale, a nine-item instrument in which students rated their anxiety in response to common mathematics situations on a five-point scale ranging from "1 = Low Anxiety" to "5 = High Anxiety." Mathematics confidence was measured using an adapted version of the Mathematics Confidence Scale, comprising seven items rated on a symmetrical five-point agreement scale. Minor linguistic adjustments (e.g., "math" to "maths") ensured cultural relevance for UK students.

As reported in earlier analyses [18], "students' mathematics anxiety (at both the overall and component levels) decreases throughout secondary education, however there is no corresponding increase in

mathematics confidence." This finding is striking because it challenges the long-standing assumption that reductions in anxiety naturally and consequently lead to increases in confidence.
Instead, the data suggest a more complex emotional shift. Students become less anxious about mathematics over time, but they do not become more confident. The emotional energy previously tied to worry, tension, and fear does not appear to be redirected into positive self-belief or engagement.

This pattern is precisely what the proposed construct of mathematics apathy predicts. When perceived control remains low—students still doubt their ability to succeed—but perceived value also declines, reductions in anxiety do not produce positive affective states. Instead, students may shift into a deactivating emotional state characterised by detachment, low investment, and minimal cognitive engagement. The longitudinal data therefore provide a direct empirical illustration of the theoretical model: a movement from the high value/low control quadrant (mathematics anxiety) toward the low value/low control quadrant (mathematics apathy).

Importantly, this shift is not easily observable in classroom behaviour. Many students who report declining anxiety but stagnant confidence continue to complete tasks and comply with classroom routines. Yet their cognitive engagement diminishes. This quiet disengagement aligns with the theoretical definition of apathy as a deactivating achievement emotion and underscores the need for teachers and researchers to attend to emotional states that are not outwardly disruptive.

Taken together, the longitudinal patterns provide illustrative support for the conceptual framework advanced in this paper. They demonstrate that emotional trajectories in mathematics are not linear and that reductions in negative activating emotions do not guarantee increases in positive activating ones. Instead, when both perceived control and perceived value remain low, students may drift into a state of mathematics apathy—an emotional profile that has been largely overlooked in the literature but may be central to understanding persistent disengagement in mathematics classrooms.

5. Discussion

The framework proposed in this paper positions mathematics apathy as a critical, yet under recognised, barrier to learning. By situating apathy within control value theory, it becomes possible to differentiate it from related constructs such as anxiety, boredom, or low motivation. The longitudinal patterns observed in the Lincolnshire dataset highlight the developmental nature of apathy and its entanglement with students' mathematics mentality.

When anxiety is reduced but confidence does not increase, the emotional energy previously tied to fear and worry is not redirected into positive engagement. The present findings raise an intriguing and underexplored question regarding the affective dynamics of mathematics learning. Students report reduced worry and nervousness about mathematics within and between school years without the theorised corresponding increase in confidence. Instead, the emotional energy previously directed towards managing mathematics anxiety is not converted into positive self-belief, self-efficacy, or engagement, instead it dissipates resulting in a general apathy towards mathematics.

For teacher education, the implications are clear: apathy must be addressed explicitly and systematically. Cultivating teacher resilience and embedding apathy awareness into professional learning are two promising pathways for change. These approaches recognise that emotional barriers to learning are relational and contextual, requiring teachers who are both emotionally equipped and pedagogically empowered. Future research should explore intervention models that target both control and value appraisals, as well as the role of school culture in shaping students' emotional experiences of mathematics. As mathematics education continues to grapple with issues of participation, equity, and identity, understanding and addressing apathy is essential.

Mathematics apathy represents a silent but significant barrier to learning. Unlike anxiety, which signals distress, apathy signals disconnection. By integrating apathy into theoretical, empirical, and teacher education discourse, this paper argues for a more comprehensive understanding of the emotional landscape of mathematics learning. Addressing apathy is not merely a pedagogical challenge—it is a systemic imperative that requires resilient teachers, informed professional learning, and a commitment to fostering meaningful mathematical experiences for all students.

6. Implications

The proposed construct of mathematics apathy carries significant implications for theories of achievement emotions. By formalising the low control, low value quadrant within Control Value Theory, the construct expands the emotional landscape available to mathematics education researchers and challenges the long-standing assumption that confidence and anxiety form a single affective continuum. Recognising apathy as a deactivating emotion foregrounds the importance of emotional states that do not manifest as distress but as quiet disengagement. In doing so, the construct offers explanatory power for patterns of student behaviour and affect that existing constructs (e.g., mathematics anxiety) cannot adequately capture.

The construct also opens new avenues for empirical research. Future work will need to develop and validate measures capable of distinguishing mathematics apathy from related constructs, as well as model the developmental trajectories of perceived control and value that give rise to it. Research should examine how apathy interacts with students' mathematical identities, participation patterns, and long-term engagement with the subject. Interventions that simultaneously target control and value appraisals represent a promising direction, as does research exploring how school culture and classroom climate shape students' emotional experiences. Longitudinal and mixed methods designs will be particularly valuable for tracing how apathy emerges, stabilises, or shifts over time.

Finally, the construct has important implications for teacher education. Mathematics apathy must be addressed explicitly and systematically, requiring teachers who are both emotionally equipped and pedagogically empowered. Preparing teachers to recognise and respond to apathy involves embedding apathy awareness into teacher preparation programmes, developing pedagogical approaches that rebuild perceived control through scaffolding and mastery experiences, and enhancing perceived value through relevance, authenticity, and identity affirming practices. Supporting teacher resilience (Gu & Day, 2013) is essential for sustaining emotionally responsive teaching in the face of quiet disengagement. Addressing mathematics apathy is therefore not merely a pedagogical challenge but the potential solution for mathematical engagement.

7. Conclusion

Mathematics apathy represents a silent but significant barrier to learning. Unlike anxiety, which signals distress, apathy signals disconnection. By situating apathy within Control Value Theory and integrating insights from Social Cognitive Theory and ZPD, this paper offers a theoretical framework for understanding apathy as a distinct achievement emotion. Illustrative evidence suggests that reductions in anxiety without increases in confidence may lead to emotional disengagement rather than positive affect. Recognising and addressing mathematics apathy is essential for fostering meaningful mathematical experiences and supporting students' long-term participation in mathematics.

REFERENCES

[1] Barroso, C., Ganley, C. M., McGraw, A. L., Geer, E. A., Hart, S. A., & Daucourt, M. C., (2021) A meta-analysis of the relation between math anxiety and math achievement, Psychological Bulletin, 147(2), 134–168. https://doi.org/10.1037/bul0000307
[2] Li, Q., Cho, H., Cosso, J., & Maeda, Y. (2021). Relations between students' mathematics anxiety and motivation to learn mathematics: A meta-analysis. Educational Psychology Review, 33(3), 1017–1049. https://doi.org/10.1007/s10648-020-09589-z
[3] Pekrun, R. (2006). The Control-Value Theory of Achievement Emotions: Assumptions, corollaries, and implications for educational research and practice. Educational Psychology Review, 18(4), 315–341. https://doi.org/10.1007/s10648-006-9029-9
[4] Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.
[5] Ashcraft, M. H., & Krause, J. A. (2007). Working memory, math performance, and math anxiety. Psychonomic Bulletin & Review, 14(2), 243–248.
[6] Dowker, A., Sarkar, A., & Looi, C. Y. (2016). Mathematics anxiety: What have we learned in 60 years? Frontiers in Psychology, 7, 508.
[7] Hembree, R., "The nature, effects, and relief of mathematics anxiety", Journal for Research in Mathematics Education, 1990, 21(1), 33–46. https://doi.org/10.2307/749455

[8] Pajares, F., & Miller, M. D. (1994). The role of self-efficacy and self-concept beliefs in mathematical problem-solving: A path analysis. Journal of Educational Psychology, 86(2), 193–203. https://doi.org/10.1037/0022-0663.86.2.193
[9] Strawderman, V. W. (1985). A Description of Mathematics Anxiety Using An Integrative Model (Unpublished Doctoral Dissertation). Georgia State University.
[10] Meece, J. L., Wigfield, A., & Eccles, J. S. (1990). Predictors of math anxiety and its influence on young adolescents' course enrollment intentions and performance in mathematics. Journal of Educational Psychology, 82(1), 60–70. https://doi.org/10.1037/0022-0663.82.1.60
[11] Hunt, T. E., Clark Carter, D., & Sheffield, D. (2011). The development and part validation of a scale to measure mathematics confidence, mathematics anxiety, and attitudes towards mathematics. Journal of Psychoeducational Assessment, 29(5), 436–447
[12] Broda, M. D., Ross, E., Sorhagen, N., & Ekholm, E. (2023). Exploring control-value motivational profiles of mathematics anxiety, self-concept, and interest in adolescents. Frontiers in Psychology, 14, 1140924. https://doi.org/10.3389/fpsyg.2023.1140924
[13] Ganley, C. M., & McGraw, A. L. (2016). The development and validation of a revised version of the math anxiety scale for young children. Frontiers in Psychology, 7, 1181–1199 https://doi.org/10.3389/fpsyg.2016.01181
[14] Vygotsky, S. L. (1978). Mind in Society: The Development of Higher Psychological Processes. Harvard University Press.
[15] Bandura, A. (1996). Social cognitive theory of human development. In T. Husen & T. N. Postlethwaite (Eds.), International encyclopedia of education (pp. 5513–5518). Pergamon Press.
[16] Carey, E., Hill, F., Devine, A., & Szűcs, D., "The modified Abbreviated Math Anxiety Scale: A valid and reliable instrument for use with children", Frontiers in Psychology, 2017, 8, 11. https://doi.org/10.3389/fpsyg.2017.00011
[17] Hendy, H. M., Schorschinsky, N., & Wade, B. (2014). Measurement of math beliefs and their associations with math behaviors in college students. Psychological Assessment, 26(4), 1225-1234. https://doi.org/10.1037/a0037688.
[18] Smith, J., Fotou, N., & Sharpe, R., "Changes in mathematics anxiety and mathematics confidence", International Journal of Mathematical Education in Science and Technology, 2025, 1–19. https://doi.org/10.1080/0020739X.2025.2475928