

Emotions as Signals: A Methodological Framework Combining Achievement Emotion Theory and Mathematical Wellbeing

Julia L. Hill
RMIT University
julia.hill2@RMIT.edu.au

Jodie Hunter
Massey University
j.hunter1@massey.ac.nz

Matt Sexton
Australian Catholic University
matthew.sexton.acu.edu.au

Tracey Muir
Australian Catholic University
tracey.muir@acu.edu.au

Sharyn Livy
Monash University
sharyn.livy@monash.edu.au

Donna King
Australian Catholic University
donna.king@acu.edu.au

Emotions are central to students' mathematical experiences, shaping how they engage, persist, and ultimately flourish in mathematics. Pekrun's (2006) Control-Value Theory (CVT) provides a well-established framework for understanding how achievement emotions arise through students' appraisals of control and value in learning contexts. The mathematical wellbeing (MWB) framework complements CVT by specifying the content of those value appraisals in mathematics through seven empirically validated ultimate values: accomplishments, cognitions, engagement, meaning, perseverance, positive emotions, and relationships, which, when fulfilled, foster students' MWB (Hill & Hunter, 2024). Importantly, positive emotions are consistently the value students are least likely to fulfil yet most strongly associated with overall MWB (Hill & Hunter, 2024), underscoring the need to better understand students' emotional experiences in mathematics. Together, CVT and MWB offer a theoretically coherent pairing in which achievement emotions function as signals of value fulfilment or conflict, and the MWB framework provides the broader context for understanding those emotions as an appraisal process, revealing which values are at stake.

To explore this combined framework (CVT+MWB), we applied it to existing datasets of students' open-ended written responses about their mathematical experiences, testing whether achievement emotions could serve as diagnostic signals and the MWB framework as the analytic tool for interpreting underlying values. For example, one student wrote: "When I finally get a question right that I've been struggling with for a while, it makes me feel really happy". Here, happiness functions as the emotional signal, while the MWB values of perseverance and accomplishments provide the interpretive context: the student's positive emotion is contingent on sustained effort through difficulty and the sense of achievement that follows. This example, like many others in our dataset, illustrates how emotions rarely appear in isolation from values; rather, each emotional experience points toward specific conditions of value (un)fulfilment that characterise a student's mathematical experience.

Building on these findings, we next apply this combined framework to analyse primary students' emotional responses during mathematics learning, captured through emotion diaries. In doing so, we offer an innovative approach to understand not only how students feel in mathematics, but why.

References

- Hill, J. L., & Hunter, J. (2024). Student mathematical wellbeing across schools in New Zealand. *New Zealand Journal of Educational Studies*, 59, 211–234.
- Pekrun, R. (2006). The control-value theory of achievement emotions. *Educational Psychology Review*, 18(4), 315–341.

(2026). In N. Berger, M. Thompson, J. Ley & C. Wilsmore (Eds.), *Beyond boundaries: Strengthening futures in mathematics education. Proceedings of the 48th annual conference of the Mathematics Education Research Group of Australasia*, Sydney (p. 492). MERGA.