



## Unlocking minds by conceptually focused, student-centred explicit mathematics teaching and quantitative evidence for effectiveness

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The conference theme “Unlocking minds” offers an interesting metaphor for goals of mathematics education: all minds can grow, but some have been locked. The theme holds an interesting ambiguity of whose minds we want to unlock:

First, mathematics education can develop and investigate instructional approaches that contribute to unlock all students’ minds. Unlocking formerly underserved students’ minds requires conceptually focused mathematics teaching approaches, with student-centred and explicit teaching practices for explicating meanings and mathematical structures. There seems to be an emerging international academic consensus that overcoming two false dichotomies (procedural vs. conceptual focus and explicit instruction vs. inquiry approaches) is required for empowering students to fully develop their mathematical potentials. However, this academic consensus has not yet reached all mathematics teachers and policymakers.

Second, the implementation of conceptually focused student-centred instructional approaches should go along with *unlocking some teachers’ minds* to overcome low ambitions for underserved students and empower them for ambitious teaching practices. Indeed, research projects showed that teachers’ minds could be unlocked in professional development programs, e.g. by adopting more equitable orientations with higher ambitions.

Third, mathematics education research should aim at *advising policymakers* about promising instructional approaches and teaching practices. Yet, our advisory power is sometimes restricted when the idea of empirical evidence is narrowed down to the so-called gold standard of hard quantitative evidence from randomized controlled trials. In this case, the entire spectrum of design research, qualitative classroom research, and qualitative professional development research, from which many highly important insights into the complexities of classroom ecologies were obtained, are then at risk of being sacrificed.

Fourth, as we cannot easily change policymakers’ minds, this contribution suggests *unlocking our researchers’ minds* by providing first deep qualitative insights, and based on these, also hard quantitative evidence, which policymakers often look for. In the talk, I gave three examples from Dortmund research on conceptually focused, student-centred approaches with successive qualitative-quantitative research strategies. The examples illustrate that tests and randomized controlled trials – often criticized as too narrow in their learning goals (when limited to procedural skills), and in their short-term and black-box nature – can also be applied to deeper phenomena and subtle effects identified in qualitative research. Unlocking my mind as a qualitative researcher led me to overcome the fear of reducing complexity in quantitative designs when the qualitatively generated hypotheses refer to deep phenomena. Of course, the examples of successive mixed methods research sketched in the talk will need further elaboration and ongoing academic discourses about our future research strategies.

For more information, please refer to the full paper presented at the 47<sup>th</sup> Annual Conference of MERGA in July 2025.

Prediger, S. (2025). Unlocking minds by conceptually focused, student-centred explicit mathematics teaching and quantitative evidence for effectiveness. In S. M. Patahuddin, L. Gaunt, D. Harris & K. Tripet (Eds.), *Unlocking minds in mathematics education. Proceedings of the 47th annual conference of the Mathematics Education Research Group of Australasia* (pp. 13–21). Canberra: MERGA.