

DESIGNING FOR TEACHER REFLECTION AND ENGAGEMENT WITH RESEARCH ON CONNECTED MATHEMATICAL IDEAS

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A great deal of research has been done to characterise important connections and dependencies between mathematical ideas. These have been shown to play important roles in teaching and learning mathematics (Tall, 2013). However, there are challenges when it comes to incorporating this research into teacher learning. Considerably less research exists to inform strategies for helping teachers to engage with research implications for the nature and uses of these connections in their work.

In this design-based research project, we are exploring teacher responses to representations of mathematical connections and their research basis in order to develop and refine theoretically-grounded design principles for representing this information in a way that leads to positive outcomes when implemented with teachers. In Cycle 1, positive outcomes were initially defined as (1) stimulating teachers' reflection on their mathematical content knowledge, in particular with respect to connections, and (2) supporting critical engagement with research. We developed a framework for creating materials to aid teachers' engagement. The theoretical foundations for this framework include the DeFT framework for learning with multiple representations (Ainsworth, 2006) and the domain-specific theories of the structure of mathematics learning (Tall, 2013).

To complete Cycle 1, we implemented the initial version of the designed materials with 20 mathematics PGCE (education postgraduate) students as part of a three-day workshop. Afterwards, 20 students completed a qualitative questionnaire, and 11 participated in interviews. Results indicated that attitudes about various aspects of the materials were broadly positive and suggested several specific design updates and an additional design principle. The updated materials will be implemented in a digital format in Cycle 2. Overall, Cycle 1 provided qualitative evidence that teachers were being stimulated to reflect on their content knowledge and were engaging critically with research to the degree possible in the time frame of the workshop, and suggested ways that critical engagement with research could be better supported. Details and research in progress will be discussed further in the presentation.

References

- Ainsworth, S. (2006). DeFT: A conceptual framework for considering learning with multiple representations. *Learning and Instruction*, 16(3), 183-198.
- Tall, D. (2013). *How humans learn to think mathematically: Exploring the three worlds of mathematics*. Cambridge University Press.