INVESTIGATING THE MATHEMATICS TEACHING EFFICACY BELIEFS OF STUDENT TEACHERS

Dr Aisling Twohill, Dr Siún Nic Mhuirí, Dr Lorraine Harbison
CASTeL, Dublin City University, Dublin, Ireland

Introduction: Beliefs about self-efficacy are highly connected to student-teachers' willingness to learn, and to adopt progressive teaching methodologies (Zimmerman, 1999; Enochs et al., 2000; Swars, Smith, Smith, & Hart, 2009). As teacher-educators, we endeavour to optimise our teaching so as to support the development of positive efficacy beliefs among our students. This research study seeks to explore the Mathematics Teaching Efficacy Beliefs of student teachers at primary level as part of a longitudinal design-research study, whereby research findings will guide planning for future modules.

I actually like teaching it because there is room for a lot of activities. It is kind of nice to see them having fun along the way while learning and seeing them get something is good as well
Ruth

Fun

Theoretical Framework

Mathematics Teaching Efficacy

I brought them on a maths walk, so we were looking for shapes in the park and that kind of thing. They really were able to connect what we were doing then to real life, and I really liked that, it was good.
Jane

Meaningful

PERSONAL TEACHER EFFICACY

Student teachers' perception of his/her personal effectiveness and ability to teach. Researchers have demonstrated links between effective teaching and teachers' self-efficacy beliefs and confidence in their own mathematical competency (e.g., Ma, 1999).

TEACHING OUTCOME EXPECTANCY

Student teachers' belief that effective teaching can result in quality learning outcomes for all children regardless of a child's background, aptitude or disposition (Enochs et al., 2000).

Methodology

The Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) of Enochs, Smith and Huinker (2000) was employed to measure the overall efficacy beliefs of teachers, and also the beliefs within two subscales, the Personal Teacher Efficacy, and Teaching Outcome Expectancy. A convenience sample of 40 undergraduate students participated in a questionnaire based upon the MTEBI with additional questions relating specifically to the content of a Mathematics Education module recently completed by the students. The sample was drawn from a year group of 440 students by invitation.

The same cohort of 440 students was also invited to attend semi-structured focus-group interviews. In total, three focus-group interviews, each with 5 -6 participants, took place. The interview schedule was based on an adapted interview protocol by Swars (2005) and included questions related to issues arising from the MTEBI analysis as well as students' experiences of teaching mathematics on School Placement and their perceptions of the research module. Nvivo was used to facilitate the thematic analysis (Braun & Clarke, 2006) of transcripts.

He kind of like instilled into us like maths is the most important subject. And I kind of hold that to now. That kind of stuck with me. That's why I kind of devoted most of my time in secondary school to maths and that's the main subject I focused on. And it's the most one I enjoy anyway and I think it's the one that holds the highest responsibility I think in actual education.
Ben

Inspiring

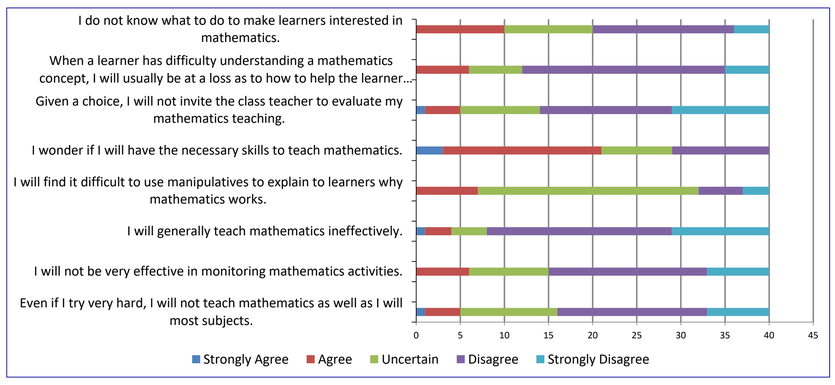
Results

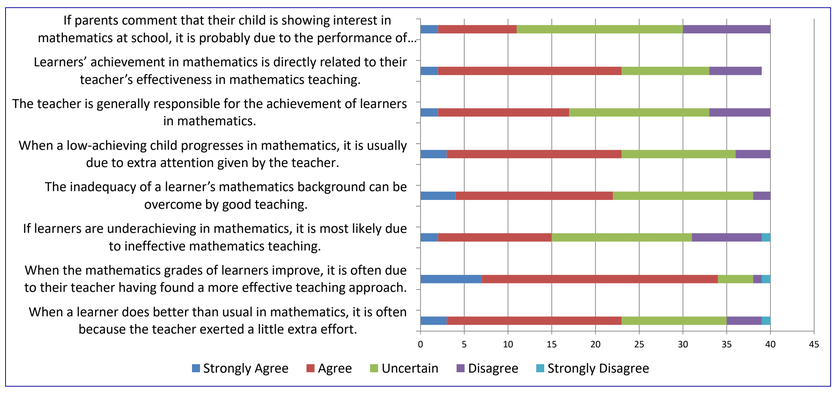
The MTEBI questionnaire consists of two independent subscales; the Personal Mathematics Teaching Efficacy (PMTE) subscale and the Mathematics Teaching Outcome Expectancy (MTOE) subscale.
Each item has five possible responses on a Likert Scale ranging from strongly agree to strongly disagree.

Results indicate that average students' self-efficacy scores (2.39) and outcome expectancy belief scores (2.54) hover around the midpoint of the Likert Scale and so a more in depth analysis is necessary.

On the PMTE scale, nearly three-quarters of respondents believe that they may not possess the skills necessary to teach mathematics and half of the respondents believe that they have a difficulty making mathematics engaging for the learners in their classrooms (Figure 1).

On the MTOE scale, positive correlation between teacher efficacy and learner achievement was noted from over half of the participants to four items but responses to other items appear contradictory. In particular, some responses suggest that students believe that when the mathematics grades of learners improve, then this is due to the effectiveness of teacher. However, the corollary is not true. That is, that underachievement is not a reflection on teacher' effectiveness (Figure 2).





Results

Focus group interviews.

For the purposes of this poster, we focus solely on student responses to questions on their success and challenges in engaging pupils in mathematics.

Across the focus-groups, the majority of students identify concrete materials as very important for engaging children but many also discussed the challenges these resources raised for them as novice teachers in terms of classroom management and organisation.

Emerging less strongly, is the idea of connecting mathematics with the real lives of children as a way to engage pupils. Students gave contrasting perspectives on this with some citing it a success of their School Placement experience and others considering it a challenge.

Manipulatives on School Placement	*N=16*
Did use	14
Did not use	1
Did not specify	1

			Classroom Management			
Commented on Manipulatives as	*Supported Understanding*	*Representation*	*Supported Engagement*	*Challenging*	*Not challenging*	*Challenging to access*
Number of students (n=16)	5	3	5	4 incl Marie	5 incl Marie	4

Conclusion: The research presented in this poster aims to unpick the ways in which our teacher education modules *could* and currently *do* support the development of positive efficacy beliefs in our students. We have highlighted one aspect of the students' efficacy beliefs in terms of their sense of their proficiency in the use of concrete materials and their understanding of the role that concrete manipulatives could play. While student expressed a consistent sense that concrete materials are "useful", and indicated an understanding that they were expected to use concrete materials, uncertainty persists about their proficiency to use them in meaningful ways, and to manage the classroom logistics and availability.

References:

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational psychologist, 28(2), 117-148.

Bandura, A. (1999). Social cognitive theory: An agentic perspective. *Asian journal of social psychology, 2*, 21-41.

Bates, A.B., Kim, J. & Latham, N. (2011). Linking preservice teachers' mathematics self-efficacy and mathematics teaching efficacy to their mathematical performance. *School Science and Mathematics*, *111*(7), 325-333.

Boaler, J., Wiliam, D., & Brown, M. (2000). Students' experiences of ability grouping: Disaffection, polarisation, and the construction of failure. *British Educational Research Journal*. 26(5), 631 - 648.

Braun, V., & Clarke, V., (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

CAST (n.d.). *Top 5 UDL tips for fostering expert learners.* Retrieved from http://castprofessionallearning.org/project/top-5-udl-tips-for-fostering-expert-learners/

Enochs, L. G., Smith, P. L., & Huinker, D. (2000). Establishing factorial validity of the mathematics teaching efficacy beliefs instrument. School Science and Mathematics, 100(4), 194-202.

Ma, L. (1999). *Knowing and Teaching Elementary Mathematics*. Lawrence Erlbaum Associates, Mahwah, NJ.

Swars, S. (2005). Examining perception of mathematics teaching effectiveness among elementary preservice teachers with differing levels of mathematics teacher efficacy. *Journal of Instructional Psychology, 32*(2), 139-147.

Swars, S. L., Smith, S. Z., Smith, M. E., & Hart, L. C. (2009). A longitudinal study of effects of a developmental teacher preparation program on elementary prospective teachers' mathematics beliefs. *Journal of Mathematics Teacher Education*, 12(1), 47-66.

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary educational psychology*, *25*(1), 82-91.

With special thanks to **DCU Incorporation: Institute of Education Shared Research Fund (SRF)**