
MTED Editorial: Celebrating ways forward and recognising dilemmas

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Welcome to Issue One of 2021, a year that continues to challenge us in our lives, as well in our teaching and research, as we continue to manage the impact of the COVID-19 pandemic. We realise that countries around the globe are coping with continued disruptions to teaching both in schools and in teacher education in many ways. It is during this time that questions about regarding mathematics teacher education, and we have learnt much from the innovations that many of us were asked to engage in rapidly. We have continued to find solutions to didactic problems as well as raise provocations.

There are seven articles in this issue, many of which were first submitted for review prior to the pandemic taking hold. Nevertheless, these articles illustrate how research not only highlights ways forwards, but reveals dilemmas about mathematics teacher education from early years to primary and secondary mathematics. All the articles in this issue refer, in their own way, to research that challenges traditional models of teaching often associated with teacher centred instruction and the practice of multiple examples with limited student interaction. The articles use a variety of research methodologies and present findings that indicate the potential of new strategies to move preservice and in-service teachers forwards in developing and honing effective teaching practices. They also provoke questions and indicate further areas for research.

Two of the articles, Cutting and Larkin, and Erbilgin and Arikan, challenge traditional models of teacher education and teacher placement for early years and elementary pre-service teachers (PSTs). Cutting and Larkin's article challenges the role of feedback in online early years and primary courses in Australia by exploring the use of video feedback. Evidence suggested that the videos had an affective impact on PSTs through the tone of the presenter and the positive focus on PSTs' capacity to teach mathematics, often building on the strengths of the cohort. The PSTs referred to the strength of teacher presence in the videos, but requested further individualised feedback to provide personal support for their knowledge and teaching. Cutting and Larkin's article is particularly relevant as teacher education courses continue to move online. The recognition of such dilemmas helps to consider how social presence within a community of inquiry (Garrison et al., 2000) can support not only affective aspect of teacher presence, but also individual reflection on mathematical knowledge for teaching.

Erbilgin and Arikan's article also refers to reform-based practices. Their study relates to didactic-mathematical knowledge (Pino-Fan, et al., 2015) and focuses on reform-minded teaching (RMT) as an aspect of institutional knowledge presented as part of the teacher education programme for elementary PSTs in Turkey. Such reform-minded teaching promotes conceptual understanding, problem-solving and whole class discussion. Erbilgin and Arikan's study used the Reformed Teaching Observation Protocol (RTOP) through a lesson study approach to investigate PSTs changes in teaching approaches towards RMT. The RTOP promoted didactical discussions amongst the PSTs, suggesting a co-construction of institutional knowledge towards RMT. The PSTs developed alternative teaching strategies, revised instructional decisions, and motivated their students to learn. Despite these advances in pedagogy, the PST paid limited

attention to epistemic aspects of RMT, that is, their own knowledge of mathematics in developing students' mathematical understanding.

Two articles Jakopovic and Gomez-Johnson, and White, Johnson and Goos, investigated new ways of developing mathematical knowledge for teaching based on communities of practice (Wenger, 1998). Jakopovic and Gomez-Johnson reviewed the potential of wider professional experiences as a way to add value in secondary PST mathematics education. Recognising the lack of student engagement in mathematics in secondary schools, the study engaged undergraduate PSTs in learning communities based on Wenger's situated learning. In promoting a new way forward in school placement, wider professional experiences provided mentoring through critical conversations about real classroom settings and recognition of student needs. Based on Wenger-Trayner & Wenger-Trayner's (2014) seven types of value the study provided evidence of transformative value at early stages of the PSTs' training. The PSTs' reflective narrative of their learning experiences often focused on teaching rather than on the mathematics, raising the dilemma of how to promote mathematics value over teaching value within communities of practice.

White, Johnson, and Goos further challenged traditional ways of PST education by questioning the unidirectional mentor-mentee model and exploring the potential of a bi-directional community of practice model (Wenger, 1998). Recognising the difficulties experienced by teachers in Ireland in enacting changes and introducing problem solving into secondary classrooms, the study explored how PSTs, as part of a CoP within a school, could act as agents of change. Through an action-research approach the study provided evidence of a bi-directional learning experience between mentor and mentee which began to challenge assumptions that teachers replicate the way they were taught. The in-service teachers re-evaluated and altered existing conversations about their practices as they worked with the PSTs. These findings redefined the mentor-mentee relationship for secondary PSTs within school placements, suggesting PSTs can act as agents of change. Despite these encouraging outcomes, reflections and re-evaluations often referred to student disposition, and engagement. Hence further research into how a bi-directional model can also encourage re-evaluations of the specialised knowledge of mathematics (Ball et al. 2008) should be further studied.

The articles by Roberts and Restani, challenge the norms of classroom practice, deficit models and social justice in mathematics classrooms with in-service teachers. Roberts's article with middle grade teachers in the United States, presents research intended to address limited questioning skills and lack of teacher preparation for English Language Learners (ELL). Recognising the relationship between content and language in developing effective classroom discourse, Roberts' research was based on types of questions (Boaler & Brodie, 2004) and involved the teachers in an inquiry process to evaluate their use of questions. The inquiry changed the teachers' expectations of ELL and there was evidence that they "raised the bar" in their teaching by moving from a deficit to a more positive view of ELL in mathematics. Despite these changes, the teacher and the students were not used to using new types of questions, and were unfamiliar with the new discourse as it challenged existing socio-mathematical norms. In addition, when attending to the questions, the teachers noticed their dispositions towards their students, but focused less on the mathematical knowledge that was developed.

Restani's article focused on teaching for social justice with secondary in-service teachers in a classroom, also in the United States. Through a practitioner research approach, Restani focused on teacher and student agency within a low socio-economic status (SES), multicultural classroom. The aim of the study was to deepen students' mathematical understanding through reform-based practice (Sherin, 2002) rather than traditional rote-based practices normally associated with low SES students. The study introduced Chapin et al.'s (2013) Talk Moves as a way to encourage

student voice and position the students as 'doers' of mathematics. The findings suggested that the teacher gradually moved from the front of the classroom to the side as the students' identity as doers of mathematics developed. This seemed a small but very important victory. Restani noted, however, that the discussion often focused on the teacher guiding the correctness of answers from the side rather than students evaluating the correctness themselves, an ultimate indication of agency.

Dogan Coskan, Bostan, and Rowland's article explores one primary in-service teacher's mathematics knowledge for teaching. Based on the Contingency dimension of the Knowledge Quartet model (Rowland et al., 2005) the study examined how the teacher reflected on contingent moments or unplanned events when teaching area measurement. The case study suggested that, by reflecting on such moments, the teacher increasingly incorporated more incorrect responses working with students. However, despite the teacher focus on anticipation of complexity (knowing common errors and difficulties) the teacher did not always respond with a pedagogical action to address students' difficulties. This result raised the question how professional development can help teachers become aware of such moments. In addition, a further question is raised how much the appropriate incorporation of contingent moments puts demands on the mathematical knowledge of the teacher.

The articles have challenged assumptions of teacher education for both pre-service and in-service teachers. The articles suggest new aspects to take on board as we move forward in mathematics education, with increased use of online teaching, social justice, appropriate incorporation of student responses, PST school placements and relationships with mentors, and reform-based practices. Such studies have the potential to help teachers transform practice, rather than replicate their own experiences of teaching mathematics (Jaworski, 1994). Whilst the studies all show ways forward for didactical approaches, they also suggest provocations and dilemmas in relation to the relationship between pedagogical knowledge and mathematics knowledge for teaching, and in realising the tensions between valuing knowledge of teaching and knowledge of mathematics. Research is still needed to increase our understanding of the special balance between pedagogical knowledge and content knowledge.

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