

MTED Editorial: Challenges and Opportunities

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Welcome to the first issue of MTED for 2020. What a challenging year it has been. The COVID-19 pandemic has interrupted social, economic, and cultural life and impacted on people's lives worldwide. Our thoughts are with all members of our extended mathematical community, who have experienced adverse effects as a result of the virus. COVID-19 restrictions have meant that many of us have had no or limited access to research sites and have been tasked with reimagining our teaching approaches to accommodate online learning. While these effects have been challenging, they also provide opportunities for us to reconsider our research and teaching approaches. The rapid shift to online learning in many educational contexts is an area that is ripe for research, and for mathematics teacher educators, research into one's own practice could examine the impact of this learning on pre-service teachers. Opportunities are also available in the work we do with teachers. While facilitation of in-situ professional learning has been impacted, online delivery has opened access to professional learning seminars, conferences, and expertise that is available to teachers world-wide. We hope that you have had the opportunity to reimagine your role, and if not, that some of the articles in this issue may ignite some ideas to both revitalise your research and your teaching.

Before providing an overview of the articles in this issue, we would like to take this opportunity to pay our respects to one of MTED and MERGA's founding members, Judy Mousley, who passed away recently. Judy was a life member of MERGA and President of MERGA for two consecutive terms from 2006-2009. During this time, she organised and managed the Executive Committee and provided strategic leadership in relation to growing the association and positioning it as an advocate for teacher education. As a special feature of her tenure as President, Judy focussed on recruiting and retaining members, with a particular concern for new and inexperienced researchers. This saw her organising and developing special events for new delegates and neophyte researchers at the annual conference each year. Many early career researchers have benefited from Judy's encouragement and advice. During her presidency, Judy also facilitated a strong working relationship with AAMT, and notably developed and contributed to AAMT's Reasoning Top Drawer (<https://topdrawer.aamt.edu.au/Reasoning>).

Judy provided wonderful inspiration and support for research and teaching in mathematics education. She was the inspiration behind a focus on researching teacher education in MERGA and responsible for setting up MTED which continues to go from strength to strength as an open access journal. Through her contributions to MERGA, Judy added significantly to the quality of the association and its value to its members, as well as the mathematics education community at large. She will be sadly missed.

This issue contains six articles all of which provide examples of the challenges and opportunities that mathematics teacher education entails. Questioning is a core practice used comprehensively in many areas of teaching mathematics, but it can be challenging to teach pre-service teachers about the use, purpose and importance of questions. Kabar and Taşdan's study aimed to investigate the types of questions used by pre-service middle school mathematics teachers (PSMTs) and the change in their questioning approaches while conducting clinical interviews with students over the course of a semester. The results showed that the PSMTs used

six different types of questions over three interviews, which ranged from yes-no questions to probing questions. The procedural-next step questions and yes-no questions were the most preferred questions by most of the PSMTs during their interviews, despite the modelling of probing questions focused on throughout their teacher education course. These results align with previous research, which reported the tendency of mathematics teachers to ask closed and low-level cognitive questions rather than higher-order cognitive questions (e.g., Moyer & Milewicz, 2002; Sahin & Kulm, 2008). Kabar and Taşdan's research also points to the opportunities afforded through the use of clinical interviews as a teaching strategy to hone PSMTs' questioning techniques.

The challenges involved with changing teacher practices is also the subject of our second article. Gonzalez and Vargas conducted professional development over two years with in-service and pre-service teachers that combined lesson study, video clubs, and animation discussions. The intervention was designed to increase teacher noticing of student thinking over time. Using a mixed-methods approach, the researchers conducted 20 three-hour study group sessions with five teachers, then engaged them in video clubs that focused on understanding the students' mathematical thinking. Their intervention approach provides an example of sustained professional development, which, while resource intensive, is more likely to result in adoption of desired practices (Australian Association of Mathematics Teachers, 2013; Loucks-Horsley, Stiles, Mundry, Love, & Hewson, 2009). Findings from the study showed that the combination of lesson study, animation discussion, and video clubs had the effect of increasing teachers' attention to student thinking in the classroom.

Our third article also has a focus on professional learning, where the delivery was online, rather than in-situ. Yeong, Jackson, and Martinez investigated how an online course influenced teachers' beliefs toward emergent bilinguals (EBs), especially in terms of culturally responsive mathematics teaching. The online course consisted of six modules of essential topics for teaching mathematics for emergent bilinguals, with topics including culturally responsive teaching and EB-focused lesson planning. In each module the teachers read articles, watched interactive videos with embedded guiding questions, participated in discussion forums, and completed an exit assignment. The researchers adapted Aguirre and Zavala's (2013) Culturally Responsive Mathematics Teaching Framework (CRMT) to examine 27 teacher responses to pre- and post-surveys within five domains: cognitive demand, mathematical discourse, power and participation, academic language support, and funds of knowledge. The results showed that the participating teachers' beliefs began to shift from a deficit view towards an asset-based view, and moved to sociopolitical consciousness as a result of their learning in the online course. The study demonstrates the opportunity provided through an online course for teachers to develop an awareness of effective teaching and access to quality mathematics for emergent bilinguals.

The COVID-19 pandemic has marked a dramatic shift into course delivery online, which has posed challenges for those teaching institutions whose students attended full time on campus. While many students' choice of study mode was removed due to the circumstances, in other contexts, students often have the choice of studying on campus, fully online or a combination of both. Norton's article looks at what motivated pre-service teachers to choose either online or mixed mode delivery, adding to the limited empirical data on why pre-service teachers make delivery mode choices, and how those choices impacted on academic standards and student satisfaction ratings. The course delivery was informed by cognitive load and transactional distance theory and aimed to develop pre-service teachers' relevant mathematics content and pedagogical content knowledge. Pre-service teachers were surveyed at the commencement of their study to determine what motivated them to choose a delivery mode and to document prior mathematics courses completed. Their academic results at the end of each course indicated that the online pre-service teachers' cohort made greater academic gains. It is suggested that this could

be attributed to the academic capital they brought to the courses. The findings have implications for the design of mathematics pre-service teaching courses online and in mixed mode.

Problem solving is an important aspect of the mathematics classroom, and it seems logical to assume that our pre-service teachers need to be able to solve problems, in order to be able to teach problem solving. While investigating PSTs' problem-solving abilities is not new, Nielson and Bostic investigated the problem-solving performance of their PSTs as influenced by their K-12 and tertiary education problem-solving experiences. Their findings suggested that the PSTs had little to no problem-solving experiences in their K-12 education and little in their undergraduate mathematics content coursework. The implications from the study are that time focused on problem-solving experiences during university coursework is important to PSTs' growth as future teachers, who are expected to promote problem solving during future in-class instruction. The challenge remains as to how best to provide these experiences.

Our final article in this issue also focuses on problem solving but differs from the other articles in this issue in that the results are obtained from school students, rather than in-service or pre-service teachers. Russo, Minas, Hewish, and McCosh report on the use of two teaching strategies, enabling and extending prompts¹, and students' attitudes towards the use of enabling prompts in particular. We feel that the article warrants inclusion in that it provides an evaluation of teaching practices, and a nice example of the opportunities provided by linking researchers with practicing teachers. The study is set in the context that preparing enabling prompts is an important part of planning and teaching with challenging tasks (e.g., Clark, Cheeseman, Roche, & Van Der Schans, 2014; Russo & Hopkins, 2019; Sullivan, et al., 2015), with the participants being drawn from the schools in which three of the authors worked. Students were given problem solving tasks and were expected to access enabling prompts if required themselves. A questionnaire and interviews were used to determine students' attitudes to the use of these enabling prompts. Most students consistently reported that enabling prompts empowered them as learners, allowing them to both take responsibility for, and have success with, their mathematics learning. There was almost no evidence of any stigma or embarrassment associated with accessing enabling prompts. The implication is that classroom teachers can rapidly establish a culture where students access enabling prompts themselves to support their learning of mathematics through problem solving.

We hope that you enjoy reading the variety of articles in this issue, and that in doing so you are able to identify challenges in your own context, along with identifying strategies for addressing these challenges. We would be keen to hear about your experiences and would encourage you to write about your research and submit it to MTED for possible publication in a future issue.

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¹ Incidentally, the terms enabling and extending prompts were first coined by Judy Mousley

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