

## *Editorial*

---

# Developing and Broadening Mathematics Teachers' Content and Pedagogical Knowledge, Beliefs, and Attitudes

Sandra Frid, Merrilyn Goos & Len Sparrow

Papers in this seventh volume of the journal all relate to teachers' knowledge, beliefs, or attitudes concerning mathematics and the learning and teaching of mathematics. The research reported in these papers was carried out in Australia, New Zealand, the United Kingdom, and the United States. With the exception of the paper by Watson, Beswick, Caney, and Skalicky, all have a strong focus on pre-service mathematics teachers.

The Watson et al. paper reports on a professional development program with middle school teachers, designed to develop teachers' knowledge and teaching capacities in targeted mathematics topics that included mental computation, using concrete materials to reinforce number facts, and developing proportional reasoning. The study provided evidence of teacher change as a result of participation in the program, particularly in relation to general pedagogical knowledge, mathematics pedagogical content knowledge, and knowledge of learners. There also was evidence of a shift in views about mathematics, from a view of mathematics teaching as the acquisition of skills, to a view that it involves the development of conceptual understandings.

Groth's paper also focuses on supporting teachers to develop their understandings of both mathematics and the teaching of mathematics, in this case with pre-service secondary teachers and the mathematical content of stochastics. Technology played a role in this study, since the teachers participated in an online learning environment in the form of an asynchronous learning network (ALN). ALN discourse was initiated by provision of a 'case' that told the story of a sample teaching situation and session. From analysis of the discourse data emerged themes that included: mathematical content and participants' reflections on their content knowledge, assessment of students' thinking, pedagogy, contextual features of the situation, and choices made by the case author in presenting details of the case. It also was found that in the ALN environment some students who normally were hesitant to participate in whole-class, face-to-face discussions made productive contributions within the online discussion forum.

Ryan and McCrae's paper examines work with pre-service primary teachers, initially with a large sample of 1st-year students in Australia, and then in a follow-up study with a smaller sample of 2nd-year students in the UK. The initial focus of the research was upon the development and use of a multiple choice test

for identifying mathematics knowledge and common errors across a wide range of primary level mathematics topics. The pre-service teachers often demonstrated similar mistakes or misconceptions to those of children. In the subsequent smaller study the test was used as a tool to identify an individual's attainment and errors, and hence provide automated feedback of potential diagnostic value to the individual regarding both content and pedagogical content knowledge.

The paper by White, Way, Perry, and Southwell goes beyond examining achievement data, to investigating possible relationships between mathematics achievement, beliefs, and attitudes. Using survey data from pre-service primary teachers enrolled in their first mathematics pedagogy unit the study found some connections, though relatively weak, between the three constructs. The authors noted that the findings did indicate that, while a teacher's attitudes towards mathematics are important, they are not sufficient to predict success in teaching. More specifically, positive attitudes are not sufficient; one must also have mathematical content and mathematical pedagogical knowledge. Thus, although not revolutionary, this research was confirmatory in its findings.

The remaining paper in this volume, by Grootenboer, looks beyond pre-service primary teachers' learning in their on-campus studies, to the potential impact of their school practicum experiences. In particular, the research examined how the impact of mathematics education units studied on campus, which were aimed at providing students with modern views of mathematics and mathematics teaching, could be minimised by practicum experiences that reinforced prior conceptions of school mathematics. The issue of sustainability of changes is then noted as a vital aspect of mathematics education in need of further research.

This seventh volume of the journal is the first one for the new team of editors. There were delays in its publication for more than one reason, including the inevitable changeover period as the previous editorial team finished their positions and the new team commenced, and the need to re-establish a satisfactory rate of submissions of suitable quality. However, we are pleased to report that as this volume goes to print, we already are well on the way to producing the next. We encourage all readers to prepare and submit papers, and we thank all those who have submitted papers so far. Finally, we thank the editorial board members and other reviewers who have devoted much time and effort into providing the valuable feedback that is needed to produce quality papers.