Editorial

Professional Development in Mathematics Education

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In collaboration with the editors of *Mathematics Teacher Education and Development* (MTED), the MERGA Executive decided in early 2007 that there would be a Special Issue of MTED on professional development in mathematics education, and that the aim would be to publish it in 2007. Buoyed by our previous successful collaborations in editing the 2005 Special Issue of the *Mathematics Education Research Journal* on early childhood mathematics and (with Glenda Anthony) the 2004 MERGA Research Review *Research in Mathematics Education in Australasia 2000-2003*, we accepted the challenge to edit the Special Issue, and you are now reading the result.

The initial call for papers was made in July, with papers to be submitted by August 31, 2007. In this initial call, the following explanation of the theme for the Special Issue was provided.

> Over the past few years there has been considerable attention to the quality of mathematics teaching from the early childhood years through to adulthood and much funding has been provided for projects to improve student outcomes. This special issue of MTED will focus on the (formal or informal) in-service teacher education and development embedded within projects. Many MERGA members have been or still are involved in various projects in different roles including project leader, manager, consultant, evaluator, researcher, or critical friend. This special edition provides an opportunity for MERGA members to reflect on and share their experiences of teacher learning. Collaborative papers across universities are particularly encouraged. Some possible questions to consider follow:
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> - Which models of in-service education are in use and how effective are they?
> - How does participating in a project contribute to a teacher's professional learning?
> - What are the supportive and inhibitory conditions for teachers' learning in the implementation of school-led projects?
> - How can the outcomes of in-service education inform and guide policy and practice?

A total of eleven papers were submitted by the due date. These papers were sent out to reviewers who had been prepared earlier for the onslaught. The reviewers were given a very short time to read and reflect on the papers and, with very few reminders, they provided constructive and critical feedback on each of the submitted papers. The reports received were evaluated by the editors and it was

agreed to invite six author teams to make minor changes that had been suggested by the reviewers and return the revised manuscripts within two weeks. All six author teams managed to do this and their papers are included in this Special Issue. Author teams for the other five papers have been sent extensive feedback on their papers and have been encouraged to resubmit revised papers to MTED for further review.

The papers in this Special Issue all address the professional development of mathematics teachers but do so using a wide variety of approaches and participants. All of the papers have resulted from active reflection on the professional learning aspects of mathematics education projects, some of which had their main aim more closely aligned with the development of mathematical learning in other people, particularly children. In each case, this reflection has enhanced the overall project and clearly improved its delivery.

The first paper in this volume provides an interesting example of how professional development in mathematics pedagogy needs to be considered within a conceptual frame that deals with the transformation of instructional practice at both an individual and school level. In this paper, Walshaw and Anthony examine, both in terms of theory and practice, how teachers and schools can work together to implement reform in mathematics education. They provide case study exemplars from the implementation of the New Zealand Numeracy Development Project to illustrate their arguments. This paper provides an interesting start to the Special Issue because of its innovative approach to theorising about the implementation of reforms that are so often the 'content' of professional development for teachers.

One of the common threads in all of the papers in this Special Issue is the devising of contextually specific models for professional development. In the second paper in this volume, Goos, Dole and Makar provide a strong theoretical foundation for their professional development approach through the concatenation of Valsiner's sociocultural theory of learning and development with a practice-based perspective of professional development. The careful planning and implementation of a professional development program over an extended period of time enabled the theoretical position to be examined in practice. Using a number of novel approaches, pairs of teachers in schools worked together on the implementation of a reform curriculum in secondary schools with the sustained and intensive assistance of the researchers. As a result, the researchers have identified a number of key characteristics of professional development of mathematics teachers that have strong implications for policy and practice.

In the third paper in this Special Issue, Makar reports on a study with four primary school teachers and their identification of ten support mechanisms or 'connection levers' seen to be important for the successful implementation of an innovation in teaching mathematics and statistics. Using a design experiment framework, Makar worked with the teachers as they embarked on learning innovative ways to teach mathematics and statistics. While the number of teachers involved is small, the intensity of the process and the many opportunities for the teachers to provide their insights into their needs has

resulted in the development of the ten connection levers, many of which are consistent with other research on effective professional development. The study provides, therefore, a new way of considering the nature of the support required by teachers involved in reform approaches in mathematics education.

There is a lot known about the principles that should be applied to professional development of teachers in order to make it effective. Muir and Beswick, however, claim that it is often the case that these principles are not completely adhered to in practice. One of these principles is that of the need for the teachers to reflect on their classroom practice and the implications of the professional development to this practice. Using the Supportive Classroom Reflection Process, including reflection on videotaped lessons, Muir and Beswick instituted a variety of reflection strategies and the paper reports on the effectiveness of these with one particular teacher in the overall study. The process is time consuming for both the teacher and the researchers but the results indicate that it was effective, particularly in terms of the professional learning of the teacher. The authors are very careful not to overclaim in terms the effectiveness of the process. They do point out, however, that, given we know already that there are many approaches to the professional development of teachers that make little positive difference to classroom practice — and sometimes may even be negative in this regard — the investment of time may well be worthwhile. The need for further research in this area is emphasised.

The paper by Diezmann, Fox, de Vries, Siemon and Norris provides an interesting variation on the general theme of the professional development of teachers of mathematics. It deals with an examination of the learning, not of the teachers participating in the professional development program but of the professional developers themselves. In particular, reflections on this learning by each of the members of the professional development team are related to the backgrounds of these members and the differing roles they played in the team. While the professional development program is detailed in the paper and has many interesting and innovative aspects, the strength of this paper is in the recognition of four domains of learning for the members of the professional development team and the relationships between these domains. The paper details examples of learning in these domains and relationships, and illustrates them with comments from the team members. As well, the paper presents a discussion of the perceived advantages and disadvantages of working in professional development teams. Happily, the advantages far outweigh any perceived disadvantages. The authors conclude the paper with a strong argument for further research in the relatively unexplored field of what makes an effective professional developer.

Preschool educators participate in many forms of professional development dealing with a wide variety of topics. However, it is unusual for a group of preschool educators to be involved in a professional development program in mathematics education, particularly one that runs for two years. The paper by Perry, Dockett, and Harley reports on the effectiveness of such a program. Set in the context of the professional development of a small group of preschool

educators in facilitating and assessing mathematics learning among 4-year-olds, the program used a series of traditional learning meetings, electronic contact between these meetings, and high-level presentations to stimulate the professional development of the educators. The paper reports on the effectiveness of these strategies through a survey and use of the participants' voices. In terms of the educators' engagement with mathematics and the documentation of its learning, the program was successful both for the educators and for the state system in which they work. In fact, the system has now proposed that the professional development initiative be extended to all government preschools in the state.

There are two particular similarities that should be recognised in this diverse collection of papers. The first is that in almost all of the cases reported, the professional development programs have reflected what is known about effectiveness of professional development, particularly in terms of the need for time to be given to the program to allow for iterated experiences and extensive reflection on these experiences and their implementation in the teachers' classrooms. Secondly, all of the papers have reported on important issues around the professional development of teachers in mathematics education using very small samples of participants. While each of the papers has provided a sound theoretical base for the programs analysed, almost all of the data collection has been in the form of case studies or other small scale methods. In spite of this — or perhaps because of it — the papers have been able to provide very rich and meaningful analysis of the particular circumstances pertaining to the studies and have been able to indicate some very useful results. Most of the authors have suggested that further research is necessary in their particular area, and these papers, collectively, provide a great deal of impetus and direction for this research.

The production of a Special Issue of MTED does not just happen. It is the result of collaboration among many people and we want to thank them all most heartily. Firstly, we wish to congratulate the authors of all eleven papers that were submitted in the initial round and, especially, the authors of the six papers that are published in this volume. All of these authors worked to very tight deadlines and yet were able to provide papers of the highest quality. Secondly, very grateful thanks need to go to the manuscript reviewers who are recognised later in this volume. For no other reward than knowing that they were assisting in the development of their colleagues and their profession, these people have worked to very, very tight deadlines and have come through with flying colours. We also acknowledge the assistance and wise advice given to us by Sandra Frid, Merrilyn Goos and Len Sparrow, Editors of MTED and Colleen Vale, Vice President (Publications) of MERGA. We do hope that this Special Issue of MTED will be helpful to the field and to our many colleagues working in the area of professional development in mathematics education. If a professional developer can use some of the information in this volume to enhance the teaching of mathematics by (at least) one teacher and that enhancement assists the mathematical learning of (at least) one child/student, then it has all been worthwhile.