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Editorial

Mathematics Teacher Education: Some International Approaches

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This special edition of Mathematics Teacher Education and Development arises from one of the working groups for action at ICME9 in Japan, titled - In-service and pre-service education of mathematics teachers. The emphasis on teacher education at the conference, and indeed in other forums and publications recently, is recognition of the emergence of an identifiable discipline of study in the field of mathematics teacher education.

The working group for action was based on the unifying theme of sharing practices and challenges in teacher education in countries around the world. A goal was to engage mathematics teacher educators in discussion to identify the language, concepts, principles, and practices that can be the shared basis of professional dialogue. The working group for action took the form of a research project, and the questions that formed the basis of many contributions were:

What are the key influences on processes and practices of mathematics teacher education?

What are the possible future directions for teacher education?

What are the directions in research in mathematics teacher education and in what way can that research contribute to improvements in teacher education?

The working group, coordinated by Peter Sullivan and Ruifen Tang, with assistance from Toshiakira Fujii, Joao Pedro da Ponte and Konrad Krainer, consisted of 41 papers by presenters from 21 countries and associated discussions. There were five themes to the discussions. The first theme addressed issues in pre-service teacher education and included reports from countries where there is active political interference in the evaluation of the quality of programs and individual graduates, others where there is active community interest in the content, countries where pre-service education is well funded, and still others where the community has considerable trust that educators can prepare teachers appropriately. In all cases, there was a sense of the multidimensionality and complexity of pre-service teacher education, and the need for ongoing renewal of the content and processes of initial teacher education and of the educators themselves.

The second theme addressed the professional education of teachers and included issues of incentives, certification, and structural renewal and recognition of teachers.

The third theme focused on in-service teacher education. Even though practices in in-service teacher education are diverse, there seemed to be agreement that in-service professional development should focus on education rather than on training, extend over multiple sessions rather than be limited to a single event, have emphasis negotiated rather than imposed, with opportunities for participants to contribute actively rather than passively receive. One key difference among countries was the extent to which there is a systematic requirement for teachers to participate in formal professional development. Such requirements seem to stimulate more innovation in the approaches to professional development programs.

The fourth theme addressed innovative methods in in-service teacher education. The projects reported on were diverse ranging from exciting uses of multimedia in teacher education, to descriptions of collaborative partnerships between researchers, teacher educators, and practitioners.

The fifth theme addressed the mathematics education of teachers. These discussions highlighted differences between those interested in primary education (ages 4-11) and those interested in secondary education (ages 11-18) with a strong focus by the latter group on the content and processes of mathematics.

This special edition presents some of the papers from the working group, rewritten in response to the discussions at the working group and the reviewing process of the journal. The articles address two key issues in initial mathematics teacher education. The first two articles relate to the use of field type experiences as the basis of study to enhance awareness of prospective teachers of aspects of teaching. The next four articles relate to the discipline content knowledge of mathematics teaching. The final article reports an initiative that links the two groups of articles.

Peter-Koop and Wollring focus on initial teacher education and particularly on the potential in using research as a tool in teacher education. Their prospective teachers observed and interviewed children while they were solving mathematics problems, and through group based qualitative processes a listening orientation to working with students was fostered.

Similarly, Da Ponte and Brunheira use fieldwork activities to allow study of mathematics classrooms, and they argue that such activities assist prospective teachers not only in developing a professional discourse, but also in adopting new perspectives on education, teaching and learning.

Each of these papers highlights the essential interconnectedness of theory and practice, and that this connection can itself be used for enhancing the study of teaching.

Four of the articles address aspects of the mathematical education of teachers. Mewborn presents an excellent and timely review and discussion of issues related to the mathematical background of teachers. She argues that mathematical experiences are necessary but not sufficient, and that prospective teachers need

mathematical experiences that are similar in nature to those emphasised in recommendations for teaching.

Morris reports on the response in her institution to the demands from the English authorities that beginning teachers demonstrate mathematical competence through specific external assessments. Morris describes stages in the process to engage students in taking responsibility for their own content knowledge and how the program progressively became more interventionist in approach.

Groves reports a program with a similar purpose from Australia, and which also arose from government policy emphasis on numeracy of school students, and so on prospective teachers. Groves reports a subject developed to extend the mathematical understandings of all prospective teachers. This subject reflects a response to the directive that all initial teacher graduates need to be numerate, understand the contribution of numeracy to daily life and be able to respond to pupils' numeracy learning needs.

Leikin and Winicki-Landman report a project with in-service teachers, but which is clearly applicable for pre-service teachers as well. They used the nature of defining as the focus of structured activities that encouraged participants to focus on the nature of mathematics through examination of defining. Their project sought to develop a broader appreciation of the nature of mathematics.

These articles highlight a clear tension for teacher educators in that in limited time, in the context of multiple competing demands, they must not only ensure the mathematical but also the pedagogical content competence of the beginning teachers.

The final article, by Baggett and Ehrenfeucht, report one possible approach for achieving this, linking intensive field base experiences with development of discipline content knowledge of mathematics teaching. They report on a program where prospective teachers are mentored by practicing teachers, and engage in fieldwork while they are learning the content of mathematics. It is conjectured that such field work activities assist prospective teachers develop professional discourse, and identify and acquire new ways of exploring educational issues in mathematics.

We wish to acknowledge the key role that Joao Pedro da Ponte played in developing the theme for this special edition, and in the reviewing of papers.

We hope that this collection of papers prompts further international collaboration on the processes and practices of mathematics teacher education.