Educating Teachers of the Future

Gregor Lomas
University of Auckland

R. Strässer, G. Brandell, B. Grevholm, & O. Helenius (Eds.) (2004), Education for the Future. Proceedings of an international symposium on Mathematics Teacher Education.
Goteburg, Sweden: Royal Swedish Academy of Sciences.
iv + 254pp. ISSN 1102-4771

This review provides a brief overview and identifies some issues (a personal reading as always) which are explored in more depth within this book relating to mathematics teacher education. The symposium on which these proceedings are based was held in response to significant changes in the teacher education systems within Norway and Sweden. The changes represented attempts to address issues of recruitment and retention from the government perspective and issues of teacher quality and enhanced children's learning of mathematics from an academic or professional perspective. While the conversations developed from the local situation the similarity of the concerns internationally is clearly evident.

The symposium set out to examine mathematics teacher education considering three main themes: (a) student teachers' motivation and mathematical competence to become teachers of mathematics with the ability to engender 'joyful learning' of mathematics; (b) the nature of the education necessary for both the student teachers and the mathematics educators, particularly with respect to the level and nature of mathematical knowledge they require; and (c) the extent and nature of links between theory and practice for both mathematics educators and teachers of mathematics.

The book initially presents the background to the symposium and commentaries on it followed by a series of individual presentations. Next comes a distillation of a series of group discussions, a synthesis and panel discussion of these and lastly a reflection on the symposium as a whole. Here, following the order of the book, I will highlight some key aspects from some individual presentations and only briefly discuss other parts.

The first several sections deal with the background to changes in Sweden and Norway, reactions to the issues raised with commentary from four international experts who developed four areas for consideration and then each took a different perspective to comment on. Barbara Jaworski discusses the 'joy' of mathematics, creating appropriate mathematical challenge for learners, the ways of knowing mathematics that teachers need, and the relationship between

teachers learning mathematics and their teaching of it. Konrad Krainer addresses reform in teacher education in terms of education systems at local, regional, and national levels whilst Terry Wood discusses the increased complexity of teaching due to changed pedagogical demands for higher levels of student engagement both in students thinking about mathematics and in active engagement with mathematical activities. Lastly, Peter Sullivan addresses constraints in terms of increased diversity, suggesting that teacher education classes should model ways of dealing with three particular aspects of diversity – the range of student readiness and commitment to mathematical learning, the appropriateness of particular teaching approaches in relation to different groups of students and their preferred learning styles, and 'productive disposition' relating to the affective response of students. In each case possible implications for teacher education are suggested.

Jill Adler (pp. 103-118) posits a metaphor of 'simultaneous translation' to describe the mathematical nature of the work inherent in teaching when addressing dilemmas in contextual and multi-lingually complex situations. She suggests that this metaphor may assist in capturing the specificity of what constitutes mathematical work in teaching. Barbro Grevholm (pp.119-133) looks at the relationship between research and mathematics teacher education and in particular, research based mathematics teacher education – What is it? And how can it be achieved? He presents an interpretation of what research based mathematics teacher education might be and implications for teacher education programmes. An outsider's perspective of mathematics is presented by Bengt Gustavsson (pp. 135-141) an astronomer. He talks of the joy of mathematics and it is a tonic to read his up-beat description of mathematics and a wonderful counter to the usual negative view of mathematics that we all too often have to endure.

The development of special centres (website addresses provided) for mathematics education, as vehicles for promoting the 'proficiency' of mathematics teachers in the USA, is discussed by Jeremy Kirkpatrick (pp. 143-157). Several of these are cooperative ventures between a number of universities with collaborative doctoral programmes which is of interest to those who exist in competitive environments where collaboration is increasingly discouraged by institutional policies. Mathematical proficiency is seen as similar to what might be termed mastery, numeracy, or competency elsewhere. It is seen as having five interwoven strands: conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive disposition. In parallel to mathematical proficiency is the idea of mathematical teaching proficiency with similar strands.

Deborah Ball and Hyman Bass (pp. 159-177) discuss the different ways in which mathematics needs to be known by teachers of mathematics as opposed to the ways in which mathematicians need to know mathematics. Key aspects are the extent of teacher's mathematical knowledge and of the ways in which students may be coming to understand mathematical ideas, the second being informed by the first but requiring ways of working mathematical beyond those

of mathematicians. They reframe the discussion in terms of the mathematical work that teachers have to do in teaching mathematics effectively and ask: "What mathematical knowledge is entailed by [required for] the work of teaching mathematics? Where and how is mathematical knowledge used in teaching mathematics? How is mathematical knowledge intertwined with other knowledge and sensibilities in the course of that work?" (p. 164). This dual nature/view of mathematics as a discipline versus mathematics as required for the teaching of mathematics is paralleled in many places, in the overall discussions, where the tension of having mathematicians in control of teacher education as opposed to mathematics educators is brought to the fore.

In line with this dualism(?) in mathematics, Mogens Niss (pp. 179-190) presents a Danish competency-based approach to a framework of what constitutes a mastery of mathematics and implications for teacher education. Two sets of four mathematical competencies are identified: "The ability to ask and answer questions in and with mathematics" – mathematical thinking, problem handling, modelling and reasoning – and "The ability to deal with mathematical language and tools" – representation, symbols and formalism, communication, and tools and aids. On this basis effective teachers are seen as ones who can develop such competencies in their students which requires another set of (six) competencies relating to pedagogy. The first four relate to diversity: curriculum, teaching, uncovering of learning, and assessment while the last two deal with professional and institutional environments: collaboration and professional development.

Reading these proceedings has been valuable in promoting reflection on the different perspectives presented and gaining insights into alternative approaches to issues surrounding mathematics education. The confirmation of common issues around the world is reassuring in reducing the sense of isolation which often occurs through the busyness of everyday work. While the possibility of using ideas presented by experts offers the reader a range of ways forward in informing their practice and shaping their mathematics teacher education programmes.

Author

Gregor Lomas, Faculty of Education, University of Auckland, Auckland, New Zealand 1035.
E-mail: <g.lomas@ace.ac.nz>