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## DG 9: Formation of researchers in mathematics education

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### Aims and focus

In common with other Discussion Groups, a pre planned structure and series of issues to be addressed were placed on the web site in advance of the ICME-10 conference.

Themes suggested for discussion included:

- What academic and professional backgrounds should be expected for individuals admitted to graduate programs in mathematics education?
- What should be the nature of the course work in higher research degrees in education and the most appropriate balance between time spent on this course work and the dissertation?
- What is the role of mathematicians as (co-) supervisors for dissertations in mathematics education?
- Should emerging researchers in mathematics education be encouraged to gain experiences in a wide range of geographic and educational contexts?, and
- Should there be an international “standard” for the training of researchers in mathematics education?

Once the participants’ motivations for attendance at the Discussion Group were shared and the participants’ specific interests were clarified, adjustments were made to the organization to optimise the relevance of the discussions to those present. A notable feature of the group – representing 13 countries from all continents – was the lively discussion throughout the three allocated time slots and the highly consistent rate of attendance.

### The beginning

As part of the introductory activities, the currency and importance of the DG 9 topic were noted, and issues particularly appropriate for discussion were identified. Evidence and topics put forward, included:

- Identification of the topic by the ICME organisers as sufficiently important to mathematics educators to warrant a separate Discussion Group,
- The diversity of higher research degree programs in place, or being planned, at different institutions, and whether there was commonality among such programs,
- How much credence should be given to the diversity of pathways taken up by those who complete a doctorate in mathematics education,
- The continuing calls, from within and beyond the educational community, for reform in mathematics education and the extent to which researchers in mathematics education should be involved and can contribute to these developments,

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- The increasing international cooperation among universities, within and beyond Europe. The Bologna Agreement<sup>1</sup> was given as an example of the former, the Cotutelle<sup>2</sup> arrangements among the latter.

It was decided to choose one of the papers (see below), placed on the web-site immediately following the first meeting of the Group, as a common basis for discussions in the second session.

### The middle

The work to be read before the second session was “Preparing Mathematics Education Researchers for Disciplined Inquiry: Learning from, in, and for Practice” written by Jo Boaler, Deborah Loewenberg Ball, and Ruhama Even – one of the chapters in the *Second International Handbook* (published in 2003 by Kluwer Academic Publishers edited by A. J. Bishop, M. A. Clements, J. Kilpatrick, and F. K. S. Leung). This chapter covered issues such as: “What does it mean to consider research from the perspective of its *practices*?”; “What is involved in mathematics education research?”, “What is there for new researchers to learn?”, e.g., with respect to reading, to forming research questions, the collection and interrogation of data, pattern making and generalizing from data, the place of mathematics in research, and communication of research findings; and “Learning in and for the practice of research”. We selected this work, out of many available, because of the authors’ novel and insightful approach to “unpacking” the practice of research in mathematics education and drawing on this perspective to examine pathways for shaping the preparation of researchers in mathematics education.

Being able to draw on a common reading was both an advantage and a disadvantage. On the one hand it helped focus the discussion; but on the other the chapter content inevitably shaped the discussion and set apparent boundaries for it.

The following issues were explored in particular:

- What is meant by *disciplined inquiry* in relation to doctoral work?
- How can such an inquiry be reconciled with being *open minded*? And with *rigor*?
- What determines if a question is *researchable*? What emphasis should be given to its components: reading critically and insightfully, methodology, data gathering, analysis, and reporting – to different audiences and via different media?
- Should researchers in mathematics education be concerned with the link between *theory and practice* and explore the impact of *theory on practice*?
- What *level of mathematics attainment* should be mandatory for researchers in mathematics education?
- To what extent should/does *social context* shape the scope and direction of research?
- What views of research are currently being promoted?
- When should research preparation be an *individual* or a *group* activity?
- Is it best to rely on a single supervisor or a supervisory team?
- What can be taught/learned from others and what only through *participation*?

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- (What) can we learn from the preparation of other professions and disciplines?
- The predominant emphasis in our discussions is on research. But how many doctoral graduates become *researchers*? Does it matter?

The diverse views expressed provoked much debate. Even within our relatively small group, it became clear that the setting in which participants worked served as a powerful filter for the issues raised in the discussion. Institutional and Departmental conventions, traditions, and aspirations were seen as powerful constraints or motivators. Some questions such as “What *level of mathematics attainment* should be mandatory for researchers in mathematics education?” and “Is it best to rely on a single supervisor or a supervisory team?” had answers which were contextually driven. For others, including “What views of research are currently being promoted?” and “What can be taught/learned from others and what only through *participation*?” group consensus was found more readily.

### The ending

The findings and issues raised during the plenary session of Survey Team 3, who focussed on *Trends in Research*, were found particularly relevant by the group and subjected to further exploration. These included the team’s findings that mathematics education research was now dominated by qualitative, small scale studies; that large scale studies are useful for generating theoretical developments and cross cultural case studies for comprehensive hypothesis testing; that longitudinal studies are needed to track developments over time; and that research carried out in English speaking countries dwarfed reports of research carried out elsewhere. Time was also put aside in the final session for participants to reflect on the wide ranging discussions. Some indicated they were well satisfied with the ground covered; others, as can be seen from the next section, thought that the debate was far from complete and had left a number of issues – critical to them – unresolved. It seems fitting to let the participants have the – almost – final word. Representative views are summarised in the next section.

### What participants indicated they had gained from the discussions

- We are starting a new doctoral program. I gained much from the discussions and learning about problems faced, and sometimes solved, by others in the group.
- We are also creating a new academic pathway in our institution. The discussions here were helpful in deciding whether we are on the right track.
- Achieving a good balance between generic and specific issues was difficult. More time could have been spent exploring in detail “what should researchers do?” and restricting this discussion to mathematics education (and not policy makers, for example).
- Keeping a focus on individual differences was a critical aspect of our discussions. There are few solutions that will suit all. We need to consider how we can best help some budding researchers refine their very broad research question; others how to broaden their horizons beyond their far too specifically focussed question – from one too simplistic to one appropriate for a major research study.

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- Did we ever define just what it meant to be a researcher? On what issues were we able to move beyond/stay blinkered within a personal perspective or that current in our institution? Having some common reading (see summary of the second session) was helpful in providing a focus and starting points for discussion.
- What must we do to avoid simply reproducing ourselves? I gained some useful pointers but am still searching for more answers. Discussions such as those we have just held are useful.
- Just what we, at our institution, can learn from the mistakes of others is what I'll be taking away from here.
- I am more convinced than ever that there is no unique prescription or recipe for producing researchers in mathematics education. Much can be learnt from experienced researchers, though it must be remembered that (successful) styles and approaches will differ.
- We could well have spent more time on skills needed by successful researchers, e.g., sharing information orally and in writing to different audiences.
- The bulk of the discussion focussed on what we can teach our students. Should we have focussed more on what we can learn from them? After all, many of those who chose the mathematics education research path are mature students, often successful in their previous work.

### A final word

Multiple pathways currently exist for the training of mathematics education researchers. On the one hand, given the diversity of contexts in which this training takes place, this seems appropriate. On the other, some routes appear to be more beneficial than others. Institutional, external, and historical factors affect the viability of different pathways. Research techniques change and fall in and out of favour. Political pressure influence perceived needs and desired outcomes. Yesterday's answer is often tomorrow's problem. Let the debate continue ...

This report was written by Gilah Leder. She is happy to be contacted at [g.leder@latrobe.edu.au](mailto:g.leder@latrobe.edu.au) for further information on the work of this DG.

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<sup>1</sup>) In 1999, Ministers of Education from 29 European countries signed the Bologna declaration on higher education. Its long term goals are to enhance and facilitate student and teacher mobility and to raise the quality of higher education. Considerable progress has already been made on its implementation, with many European universities now fully in support of the process. In the Berlin declaration of 2003, the Ministers agreed to go beyond the present focus on two main cycles (bachelor and master) of higher education to include the doctoral level as the third cycle in the Bologna Process. The general structure aimed for is a 3+2+3 years system. The general process now involves 40 countries whose ministers have declared their commitment to establishing the European Higher Education Area by 2010. The aim is not to unify the current diversity of doctoral programs into one common program. Rather students will be able to tap into different programs in different countries as they complete their degree. (Details supplied by participants)

<sup>2</sup>) The concept of Cotutelle joint or double-badged doctoral programs was developed by the French government to promote partnerships between universities in France and in other countries. Candidature in the program is conducted under joint supervision with enrolment in both the "home" and "partner" institution. Students spend approximately  $\frac{2}{3}$  of their candidature in their "home" university and the remaining  $\frac{1}{3}$  in the "partner" institutions. On completion of their doctorate they receive degrees from both universities, with the testamur and official academic record indicating that the degree was obtained under Cotutelle arrangements. Doctoral regulations of both institutions must be fulfilled. Joint-badged doctoral programs have been broadened to other countries. (Details supplied by participants)