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International perspectives on mathematics teacher professional development

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Rationale

The study of mathematics teacher education and professional development has been a central focus of research over recent decades. Also, during previous ERME conferences, various research activities regarding this topic have been presented and discussed. Within CERME 11 TWG 18, we focus on mathematics teacher education (pre-service and in-service), professional development and teachers' professional growth, teachers' professional development practices, models and programmes of professional development (contents, methods and impacts) and the professional development of teacher educators and academic researchers. TWG 18 offers a communicative, collegial and critical forum for the discussion of these and other related issues, which allows diverse perspectives and theoretical approaches and which contributes to the development of our knowledge and understanding as researchers, educators and practitioners.

Participants

53 papers were originally submitted to TWG18 and underwent a peer review process. All papers were revised by authors, according to reviewers' remarks. 43 papers were accepted as paper presentations, 10 were re-submitted for a poster presentation. Two of the accepted papers were withdrawn and one was re-assigned from another TWG. Finally, 42 papers were to be presented during the TWG sessions.

This led to the decision (according to ERME rules) to split the TWG into two sub-groups: TWG18a (with a particular focus on teachers and teacher educators) and TWG18b (with a particular focus on professional development settings).

10 posters were originally submitted and underwent a peer review process in TWG18: all authors revised their posters, according to the reviewers' remarks and all posters were accepted. Together with the re-submitted posters (see above), and 7 withdrawals, finally, 13 posters were presented during the conference poster session.

Organisation

TWG sessions 18a and 18b comprised both plenary and sub-group working phases. During the plenary phases, two (or three) papers were presented for a maximum of five minutes each, in which the authors provided their paper's central message(s) and challenging questions for discussion. These plenaries were followed by parallel sub-groups, which were each managed by one of the presenting authors. Participants were free to choose and join one sub-group, where they discussed the paper for 30-40 minutes. Afterwards, the TWG's participants met in plenary to listen to and to discuss reports of each sub-groups' central topics and to summarise emerging issues. In addition, in 18b, the five-minute presentation of papers was followed by a brief commentary to the set of papers by one of the TWG leaders.

Topics

The presentations in TWG18a and TWG18b were categorised into 13 main topics:

- Beliefs
- Educators
- Knowledge
- Noticing
- Particular Mathematics Topics
- Tools
- Curriculum Innovation and Professional Practices in Professional Development
- Evaluation of Professional Development Programs
- Collaboration and Communities in Teacher Professional Development
- Lesson Study
- Use of Video for Professional Development
- Use of ICT for Professional Development
- Initial Teacher Education

Open questions and emerging issues

This section provides several key questions and issues, which emerged during the sessions of TWG18a and TWG18b:

Beliefs

Open questions: What gets pre-service teachers into teacher education? How do we change pre-service teachers who do not want to be changed? How to support pre-service teachers to be exploratory in their teaching? What motivates mathematicians to be involved in projects with mathematics teacher educators?

Emerging issues: The potential of investigating the effect of ‘Missions’ on pre-service teachers’ thinking (e.g., getting into the habit of looking at their own experiences to make sense of the theoretical input of the course) and practices (in school placement or in their practice after graduation).

Educators

Open questions: How do educators’ theoretical perspectives change over time? Parallels between mathematics teacher educators and mathematics teachers – what makes teachers confident teaching mathematics and what makes students in classrooms confident doing mathematics?

Emerging issues: Questioning our own assumptions of what we take for granted about how mathematics could be taught and shifting those assumptions by working across boundaries of contexts and countries.

Knowledge

Open questions: What is our knowledge of the rationale that pre-service teachers have for what they do? How do we support pre-service teachers in developing through video analysis experiences?

Emerging issues: We need to have a national comparison of teachers' knowledge. Validity of simulations for measuring teaching practice.

Noticing

Open questions: How to change beliefs so that students' errors can be analysed more productively? Changing beliefs from when pre-service teachers were students themselves? Do different types of critical events influence the way the pre-service teacher interprets?

Emerging issues: Different uses of critical events and reflections across the different countries. Safe place inside the university where pre-service teachers can make errors and reflect on them.

Particular Mathematical Topics

Open questions: What about combining things that are shared between different subjects such as problem solving, e.g., mathematics and science modelling? Is it important that pre-service teachers struggle in terms of mathematical content and also struggle in the classroom?

Emerging issues: Differences in our countries producing generalist teachers (5 taught subjects) or specialist teachers (2 taught subjects).

Tools

Open questions: Action research: takes too much time for pre-service teachers to do? In different situations, do the pre-service teachers move between different roles, such as teacher and researcher?

Emerging issues: The school community as a community of practice that pre-service teachers have to enter. Action research – different experiences across countries – pre-service and in-service teachers have different experiences. Being systematic from the very beginning, thinking about quality.

Curriculum Innovation and Professional Practices in Professional Development

Open questions: How to use curriculum innovation and aim of improving student achievement for professional development? In large-scale professional development programmes, how can results similar to those that arise in small-scale programmes be achieved?

Emerging issues: Potential and limitations of practice-based professional development programs.

Evaluation of Professional Development Programs

Open questions: How to research and how to measure the impact of professional development?

Emerging issues: Relating teachers' learning to quality of instruction and students' achievement.

Collaboration and Communities in Teacher Professional Development

Open questions: What settings are successful in combining collective and collegial work with space for individual growth?

Emerging issues: The crucial role of the teacher educator/mediator/facilitator and how he/she may be trained.

Lesson Study

Open questions: Teachers' dispositions regarding personal investment in professional development are a crucial factor for the success of lesson study. What steps may be taken to improve them?

Emerging issues: Need to have a theoretical orientation regarding pre-service and in-service teachers' learning. The crucial role of the Lesson Study (LS) facilitator and how he/she may be trained. LS is complex, in particular if it is not part of the culture. There is a need for future research on how to build collaborative trust among participants.

Use of Video for Professional Development

Open questions: In observing videos, how to identify a "productive" discussion and how to measure the extent of the "productivity"?

Emerging issues: The key role of theories regarding teacher learning and of practical questions regarding working contexts in research in the use of videos in professional development.

Use of ICT for Professional Development

Open questions: How can ICT elements be used to enhance and inform teacher education and professional development? How can the implementation of ICT elements be facilitated?

Emerging issues: Role of specific facilitation and monitoring, importance of collaboration with colleagues and need for quality control / standards.

Initial Teacher Education

Open questions: What are appropriate learning and identity development aims for pre-service teachers (both primary and secondary) in different national contexts?

Emerging issues: Combining attention to didactical, cognitive, affective and social issues in Initial Teacher Education.

Summary

There is a common agreement in TWG18 on the principles leading to more effective professional development of teachers that emerged across the 13 topics: bringing new elements to the teachers' work while keeping connected to the teachers' reality; clarifying these new elements in relation to existing frameworks and practices; combining collective and collegial work with space for individual growth; and supporting teachers in introducing new elements in their practice and reflecting on their consequences and possible constraints.