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To cite this version:

Stefan Zehetmeier, Laurinda Brown, Maria Mellone, Leonor Santos, Gulseren Karagoz Akar. Introduction to the papers of TWG18: International research on mathematics teacher education and professional development. CERME 10, Feb 2017, Dublin, Ireland. hal-01949062

HAL Id: hal-01949062
https://hal.archives-ouvertes.fr/hal-01949062
Submitted on 9 Dec 2018

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TWG18: Mathematics teacher education and professional development
Introduction to the papers of TWG18: International research on mathematics teacher education and professional development

Stefan Zehetmeier¹, Laurinda Brown², Maria Mellone³, Leonor Santos⁴, Gulseren Karagoz Akar⁵

¹University of Klagenfurt, Austria, stefan.zehetmeier@aau.at
²University of Bristol, United Kingdom, laurinda.brown@bristol.ac.uk
³University Federico II of Naples, Italy, maria.mellone@unina.it
⁴Instituto de Educação, Universidade de Lisboa, Portugal, mlsantos@ie.ul.pt
⁵Boğaziçi University, Turkeygulseren.akar@boun.edu.tr

Keywords: Professional development, pre-service teacher education, in-service teacher education, teachers, teacher educators.

Rationale

The study of mathematics teacher education and professional development has been a central focus of research during the last decades. Various research activities have focused on this topic. Within TWG 18, we focus on mathematics teacher education (pre-service and in-service), professional development and teachers' professional growth, teachers' professional development practices, collaboration and communities of practice, 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

52 papers were originally submitted to TWG18. 22 of them were re-directed to other TWGs. Thus, 30 papers underwent a peer review process in TWG18: during this process, all papers were revised by authors, according to reviewers’ remarks. 29 papers were accepted as paper presentations, one was re-submitted for a poster presentation. One of the accepted papers was withdrawn. Finally, 28 papers were presented during the TWG sessions.

Two posters were originally submitted and underwent a peer review process in TWG18: both authors revised their posters, according to the reviewers’ remarks; both posters were accepted. Together with the re-submitted poster (see above), finally, 3 posters were presented during the conference poster session.

Organisation

TWG sessions 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 20-30 minutes. Afterwards, the TWG’s participants met in plenary to hear reports of each sub-groups’ central topics and to summarise emerging issues.

**Topics**

The presentations were categorised into four main topics:

- Noticing Students’ Work
- Teacher Instructional Practice
- Impact of Professional Development
- Pre-Service Teachers.

**Open questions and emerging issues**

This section provides several questions and issues, which emerged during the sessions of TWG18:

**Noticing Students’ Work:**

- **Open questions:**
  - How do we guide pre-service student teachers to notice particular things such as children’s learning?
  - How do the different global country contexts and the constraints of each system locally, make a difference when you apply a learning trajectory?
  - Is there a connection between different teachers’ views, what they see and their beliefs, based on noticing?

- **Emerging issues:**
  - Use of the language of the teacher educators in talking about errors e.g., concept image.
  - Different points of views about errors in different teacher education programmes and how we use/understand errors in our teacher education programmes. Also differences in practices of ‘noticing’.
  - Importance of context of the countries and coming to understand these to understand the organisation of the different teacher education programmes.

**Teacher Instructional Practice:**

- **Open questions:**
  - How to motivate teachers to document more of their work?
  - How do we change teachers feeling judged when getting feedback?
  - How do we understand the different notions of inquiry? What are the effective strategies to implement this approach in mathematics lessons?
  - How do we get to the mathematics? What mathematical knowledge do teachers need for inquiry approaches in mathematics lessons?
  - When we do our research, we use different tools such as philosophical perspectives and analytical frameworks. Is it the different tools that lead to different results? Is it the analytical framework that produces the results? What do we learn as teacher educators? Is that dependent on the frameworks used? Does working with multiple perspectives help us?
• **Emerging issues:**
  o Ethical and practical issues of using children to make interventions in the professional development of teachers e.g. use of video.
  o There might need to be different kinds of innovation dependent on the teachers.
  o Publishing negative cases as well as positive ones.

Impact of Professional Development:

• **Open questions:**
  o How could we ask questions to measure impact (e.g. changing of beliefs)? Are there other ways to what we do now?
  o What impact do ‘we’ want to sustain? Static image of change or dynamic change of teachers?
  o In discussing professional development, how do you track development/learning, through the discourse, through anecdotes and, or?

• **Emerging issues:**
  o Comparing behaviour of teachers in lessons and in PD raises lots of ideas to consider, such as the perceived gap between what teachers do in classrooms and how they articulate their practice in PD.
  o The challenge is how to sustain the impact of professional development beyond its delivery.
  o There are differences in language and discourses between teachers, teacher educators and politicians. There is the need to define what is a good argument in the different contexts.
  o Describing frameworks when they are not familiar.

Pre-Service Teachers:

• **Open questions:**
  o Of the language use, such as theory, used in professional discussions at the university, what do pre-service teachers learn? Are they just naming names rather than gaining a deeper understanding of pedagogical concepts?
  o Can we measure the process of pre-service teachers’ development and conclude something from it? Do we want to measure these kinds of dimensions?
  o What does it take for one to become explorative both in learning and in teaching?

• **Emerging issues:**
  o Using videos and not having access to videos in the language of the teachers e.g. any non-English language. Resource implication for creating a local bank of videos.
  o The relationship between the mathematics that a teacher has to teach and the mathematics learned by pre-service teachers in education courses offered by the teacher educator focused on conceptual development.
Finding ways to disrupt previous experiences of teaching and learning mathematics that pre-service teachers bring with them.

Moreover, some further general questions and issues concerning mathematics teacher education and professional development were discussed during the TWG sessions:

- **Open questions:**
  - Can we observe the development of teachers in their pupils’ learning?
  - Does research in mathematics teacher education support the work in schools? Are we critical about our own practices?
  - How do we recruit participants for professional teacher development? How do we promote PD effectively? Use of social media?

- **Emerging issues:**
  - Complexity of appropriation of frameworks, the language across cultures does not always transfer.
  - Writing scientific and professional journal papers with teachers that address teachers’ communities.
  - There is work to be done to create dynamical relationships between theories.
  - In researching with teachers, we attend to different things, such as the teacher might be focusing on the learning of the children and the teacher educator the development of the teacher, and we need to find ways to understand each other.