

TSG 28: In-service Education, Professional Life and Development of Mathematics Teachers : A tentative of synthesis

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TSG 28 followed TSG23 at ICME10 in Copenhagen, and the 15th ICMI Study. TSG 28 examined, 3 years later, the main question: *What do we know about the experiences and approaches developed in different countries to support the professional development of teachers for practice, in practice and from practice?*

The sessions were organised around a short presentation, followed by a critical commentary by two people, and discussions by the group. A plenary lecture by Barbara Jaworski (UK) in the first session gave a historical perspective of “Mathematics Teacher Education” as a subfield. The growth was seen through its place in international meetings (PME, ICME, CERME) and publications, in particular the *Journal of Mathematics Teacher Education*. The lecture described different themes: the nature of programmes for educating practising teachers, teachers participation in these programmes; the position of mathematics in professional development; the models of learning underlying different programmes. Finally, it pointed out key issues: nature of the collaboration between teachers and teacher educators, proximity to classroom outcomes, new insights; and the learning of teacher educators.

Sessions 2, 3 and 4, were presentations of 13 of 17 communications accepted. A brief synthesis of the other four papers was given to integrate the papers in the discussion. These sessions were organised as follow around 5 sub-themes:

Sub-theme 1: Professional life of teachers and professional development in practice-Reactors: Chritine Surtaam and Maria Teresa Freitas

- Claudia Canha Nunes (Portugal). The development of a mathematics teacher in the role of subject leader
- Ginger Rhodes, Patricia Wilson (USA). Mentoring as professional development: A case from secondary level mathematics
- Yeping Li, Rongjin Huang, Jiansheng Bao & Yadong Fan (China). Facilitating the development of mathematics teachers’ expertise through professional promotion practices in Mainland China

Sub-theme 2: Different approaches to professional development focusing on mathematics-Reactors: Yeping Li and Claudia Nunes

- Mario Sanchez (Denmark). Dialogue among in-service teachers in an internet-based mathematics education program
- Bernard Murphy (UK). In-service professional development for teachers of pre-university mathematics

Sub-theme 3: Approaches/experiences of professional development in mathematics articulated on practice- Reactors: Ginger Rhodes and Rosana Miskulin for the sub-group collaborative work; El de Geest and Mario Sanchez for the sub-group investigative activities

Sub-group: Collaborative work

- Nielce Lobo da Costa (Brazil). In-service teacher education: A collaborative basis experience with non-specialist teachers who teach mathematics.
- Adair Mendes Nacarato, Regina Celio Grandó (Brazil). Formative processes: Sharing learning experiences in geometry.

- Ana Cristina Ferreira, Maria Angela Miorim (Brazil). Collaborative work and professional development of mathematics teachers

Sub-group: Investigative activities

- Christine Suurtamm and Nancy Vezina (Canada). Professional development: Moving from telling to listening
- Carmen Lucia Brancaglioni Passos (Brazil). Continuing professional training of mathematics teachers: learning through mathematics investigation.
- Maria Teresa M. Freitas, Dario Fiorentini (Brazil). Investigative and writing in the professional development of mathematics teachers

Sub-theme 4: Professional development and curricular changes - Reactors: Yeping Li and Claudia Nunes

- Dario Fiorentini, Rosana G.S. Miskulin, Regina C. Grando, Adair M. Nacarato, Carmen L. B. Passos, Dione L. Carvalho (Brazil). Interrelation between teacher development and curricular change: a research program

Sub-theme 5: Conceptualization of professional development: designing PD at a macro level - Reactors: Christine Surtamm and Maria Teresa Freitas

- Els de Geest, Marie Joubert, Rosamund Sutherland, Jenni Back, Christine Hirst (UK). Researching effective continuing professional development in mathematics education

Outcomes of the topic study group

1. Collaborative work

Collaborative work is an important characteristic of different approaches.

The nature of collaboration between teachers/ or teachers and teacher educators

What do we mean by collaboration? We as teacher educators/researchers have to be careful about the assumption “collaboration transforms teachers”. There are different types of collaboration, and of reflections in a collaboration process. It was proposed that collaboration is different from cooperation. In cooperation, teachers are engaged in a task and they co-operate to solve it, building their solution on others’ strategies. In collaboration, there is the idea: of working together (collaboration is related to professional work); of sharing the same goals; of contributing to the practice investigated with different perspectives, different points of view, different experiences, different professional knowledge; and of opening a space of possibilities.

Differences between the different collaborative approaches developed

Some similarities between the different approaches can be pointed out, for example, they are all focusing on the work of teachers, they are organised around specific mathematical content or processes; and collaboration takes place between persons with various experiences.

But they are also important differences.

- Collaboration can be designed a priori, or emerge from the moment.
- Collaboration can involve different partners, or be around a common investigation.
- Collaboration can emerge during a process, or as a result of a process.
- Collaboration can take place between teachers with various experiences.
- Practitioners can be involved in different cultures of practice.
- Collaboration may involve different types of group: teachers, teacher educators, researchers, pre-service, in-service, or graduate students.

What is the role of the teachers involved in this collaborative work?

To characterise the programmes for practising teachers, Barbara Jaworski, in her plenary lecture, distinguished the nature of the participation of teachers involved in them:

- Courses or summer institutes led by teacher educators: teachers are considered as pupils;
- Research/developmental programmes led by teacher educators: teachers are participants;
- Collaborative research in learning and teaching: teachers are partners in research;

- Research programs in which teachers explore their own practice: teachers are researchers.

We found these different roles in our presentations, but we also found a more complex process of participation of teachers, where the role of teachers changing during the approach, for example from participation of teachers as students, to teachers who teach in their classroom, to teachers who teach other teachers, to researchers.

Collaboration: implicit power relations

The question of power is a key issue. Different approaches this question were explored.

We can relate implicit power relations to the way different partners in the collaboration occupied a certain “position of knowledge”. How is knowledge distributed between teachers and teacher educators/researchers? In the different papers, this is not always the same.

- In some cases, researchers occupied a position of expert, where, for example, teachers have to appropriate lessons built by the researchers.
- In other cases, we can speak of shared knowledge by teachers and researchers.
- Or there is co-generative or co-construction of new knowledge related to practice.
- Alternatively there is production of knowledge by teachers

Implicit power relations are also related to that of “taking an inquiry stance”. When the collaboration process between teachers and researchers is focusing on inquiry as a tool for developing classroom teaching and learning, we are confronted with the question of power. Researchers are engaged naturally in an inquiry stance, but teachers at the beginning of the process are not necessary in the same place.

Another aspect is that power can be seen as something positive. We can think to power as a strength, an ability that we can contribute to the group.

2. Investigative activities and role of reflection

What is the same, what is different? Importance of reflection

Some commonalities between the different approaches were pointed out:

- An importance accorded to reflection;
- An approach where teacher educators do not tell the teachers what to do, but allow the teachers to develop in their own way, asking their own questions;
- A supportive environment;
- A process of collaborative work;
- ‘Modeling’ ways of working with teachers, that they will possibly use in a similar way with their students;

It was pointed that reflection is a cognitive process, if often unconscious. However, it is fundamental in the process of change. There is a dialectic relation between reflection and change.

Relationships between reflection and teacher development

Not any kind of reflection can support the professional learning of teachers. Different kinds of reflection include: written reflection; oral and written narratives; self-regulated learning; and working and reflecting within the context of practice. For instance, for practicing teachers, written reflection on teaching and learning helps them to perceive other relations in their practices. The narratives provoke changes in the way people understand themselves and others. For future teachers, written reflection on mathematical teaching practices in school contributes to a better understanding of the complexity of these practices. Written reflection, having as reference the process of becoming a teacher, promotes metacognitive reflection about mathematical meanings, particularly in relation to future teachers’ conceptions and beliefs about school mathematics.

3. The position of mathematics in the professional development approaches

Three papers focussed on mathematics.

- What kind of mathematics are teachers working on?

- What do teacher educators do?
- How can we characterise the mathematical practices teachers engage in?
- What is the mathematical school discourse emerging between teachers in an internet-based environment?

4. On the learning of teachers and teacher educators

What do teacher educators/researchers learn in working with teachers, what do they learn from teachers? The learning of teacher educators/researchers is a shift of perspective:

- Teachers and teacher educators are learners in practice, they are actively learning from each other to improve their own practice.
- New knowledge is built by the researchers in this process: systematising their experiences, developing new theoretical models, and deep thinking/insight.

Working with teachers requires also a shift of perspective in the way we consider the evaluation of learning of teachers

- How can we “evaluate” (together) the growth of teachers?
- Does the professional development dynamic continue after the professional development stops? How do teachers re-appropriate for themselves the meaning of these experiences?
- What knowledge is developed in practice?

5. Conceptualization of professional development in mathematics

Some theoretical questions were underlying this TSG: What do we mean by teachers professional development? What conceptualisations emerge from research about professional development? What are their different theoretical and epistemological bases?

An innovative way to approach this conceptualisation was reported. The project is centered on the co-construction with teachers of the definition of effective continuous professional development, engaging a wide mathematics education community in a viable characterisation of CPD, which directly concerned actors involved in it.

Some reflections raised by this project were presented by Christine Suurtaam:

- A project complex and multi-faceted
- Who focused on examining a variety of professional development
- Who puts in light the important point that professional development is continuous
- Who tries to break the gap between research and practice
- Who gives voice to teachers
- Who is connecting teachers’ learning and teachers’ evidence of students learning

A book, with the different contributions presented in this topic study group, is published (see Bednarz, Fiorentini, Huang, in press).

References

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