

Pre-service Mathematical Education of Teachers

Sylvie Coppé and Ngai-Ying Wong

Overview

The topic study group on pre-service mathematical education of teachers is dedicated to sharing and discussing of significant new trends and development in research and practice about the various kinds of education of pre-service mathematics teachers and of pre-service primary teachers who teach mathematics and are trained as generalists. It aimed to provide both an overview of the current state-of-the-art as well as outstanding recent research reports from an international perspective. The group discussed research experiences with different practices of pre-service mathematical education of (mathematics) teachers throughout the world, i.e. similarities and differences concerning the formal mathematical education of teachers, types and routes of teacher education, curricula of (mathematics) teacher education, facets of knowledge and differences in their achievements and beliefs about the nature of their training, and a variety of factors that influence these differences.

Organizers Co-chairs: Sylvie Coppé (France), Ngai-Ying Wong (Hong Kong); Team Members: Lucie De Blois (Canada), Björn Schwarz (Germany), Insun Shin (Korea), Khoon Yoong Wong (Singapore); Liaison IPCMember: Gabriele Kaiser (Germany).

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Session Schedule

We received 51 proposals from different countries, 6 were rejected and at last we had 40 papers and only 37 presentations. As we had four 90-min sessions (July 10, 11, 13, and 14), two groups ran parallel in order to let 10 min to each presentation.

Each session was devoted to different issues in affect research in mathematics education.

Session 1: Tuesday, July 10, 10:30–12:00

Group A:

Buchholtz Nils, Studies on the effectiveness of university mathematics teacher training in Germany

Francis-Poscente Krista, Preparing elementary pre-service teachers to teach mathematics with math fair

Jennifer Suh, ‘Situating learning’ for teaching mathematics with pre-service teachers in a math lesson study course

GwiSoo Nah, A constructivist teaching experiment for elementary pre-service teachers

Qiaoping Zhang, Pre-service teachers’ reflections on their teaching practice

Group B

Liora Hoch, Miriam Amit, When math meets pedagogy: the case of student evaluation

Hugo Diniz, Math Clubs: space of mathematical experimentation and teacher formation

Huk Yuen Law, Becoming professional mathematics teachers through action research

Levi Elipane, Integrating the elements of lesson study in pre-service mathematics teacher education

Müjgan Baki, Investigating prospective primary teachers’ knowledge in teaching through lesson study

Session 2: Wednesday, July 11, 10:30–12:00

Group A

Zhiqiang Yuan, Developing prospective mathematics teachers’ technological pedagogical content knowledge (TPACK): a case of normal distribution

Roslinda Rosli, Elementary pre-service teachers’ pedagogical content knowledge of place value: A mixed analysis

Steve Thornton, Saileigh Page, Julie Clark, Linking the mathematical pedagogical content knowledge of pre-service primary teachers with teacher education courses

Rachael Kenney, Writing and Reflection: Tools for developing pedagogical content knowledge with mathematics pre-service teachers

Group B

Jan Sunderlik, Soetkova, Identification of learning situations during prospective teachers’ student teaching in two countries

Yali Pang, Using a Video-based Approach to Develop Prospective Teachers' Mathematical Knowledge for Teaching and Ability to Analyze Mathematics Teaching

Xiong Wang, The Video Analysis of the Authentic Classroom as an Approach to Support Pre-service Teachers' Professional Learning: A Case from Shanghai Normal University, China

Namukasa Immaculate, Measuring teacher candidate's conceptual, procedural and pedagogical content knowledge

Session 3: Friday, July 13, 15:00–16:30

Group A

Hyun Young Kang, Korean Secondary Mathematics Teachers' Perspectives on Competencies for Good Teaching

Rongjin Huang, Pre-service secondary mathematics teachers' knowledge of algebra for teaching in China

Björn Schwarz, Relations between future mathematics teachers' beliefs and knowledge with regard to modelling in mathematics teaching

Yeon Kim, Challenges to teach mathematical knowledge for teaching in mathematics teacher Education

Group B

Yuki Seo, Enhancing mathematics thinking for training mathematics teachers: a case at the department of engineering

Kiril Bankov, Curriculum for preparation of mathematics teachers: a perspective from TEDS-M

Lin Ding, A comparison of pre-service secondary mathematics teacher education in Hanover (a city in Germany) and Hangzhou (a city in China)

Khaled Ben-Motreb, Pre-service teachers' teaching practices and mathematics conceptions

Ildar Safuanov, Master programs for future mathematics teachers in Russian federation

Session 4: Saturday, July 14, 10:30–12:00

Group A

Claire Berg, Barbro Grevholm, Use of an inquiry-based model in pre-service teacher education: Investigating the gap between theory and practice in mathematics education

Loretta Diane Miller, Brandon Banes, Teaching pre-service elementary teachers mathematics through problem-based learning and problem solving

Ji-Eun Lee, Towards a holistic view: analysis of pre-service teachers' professional vision in field experiences

Diana Cheng, Discourse-based instruction in small groups of pre-service elementary teachers

Kwang Ho Lee, Eun-Ha Jang, The research on PBL Application in mathematics method course

Group B

Ceneida Fernandez, Julia Valis, Salvador Linares, An approach for the development of pre-service mathematics teachers' professional noticing of students' mathematical thinking

Erika Löfström, Tuomas Pursianen, "I knew that sine and cosine are periodic... but I was thinking how I could validate this": A case study on mathematics student teachers' personal epistemologies

Ju Hong Woo, The change of mathematics teaching efficacy beliefs by student teaching

Mi Yeon Lee, Preservnrique Galindo, Pre-service Teachers' Ability to Understand Children's Thinking

Ravi Somayajulu, Manjula Joseph, Candace Joswick, Characterizing secondary pre-Service mathematics teachers' growth in understanding of student mathematical thinking over a three-course methods series

Main Questions Discussed

Main questions were discussed such as:

- What are fundamental concepts to study the field of pre-service teacher in comparison of in-service teacher? What are special challenges for respective studies arising from the particular characteristics of pre-service teacher education and how to face them?
- What knowledge contribute to the development of the pre-service teacher? Which actions push the pre-service teacher to lost their initial experience of pupil to integrate new epistemological posture?
- What are the contribution of the different tolls (technology, writing, reflection, video) during the teacher training? How can a common core of the concept of "pedagogical content knowledge" be described against the background of its different conceptualizations?
- Are the challenge different in function of countries? What is the influence of the curriculum on practice of pre-service teacher?
- What kind of mathematic could contribute to the development of pre-service teacher? And how can it be taught adequately?
- Why do we teach mathematics and why this answer influence the teacher training?

Issues and Findings

Quite a number of issues on pre-service teacher education were identified, which includes considerable drop out rate, lack of knowledge and even lack of interest in mathematics among potential teachers in some countries. There also exists

disagreement between goal and reality. For instance, while constructivism is advocated in the school curriculum, teacher education programmes did not provide such experience to student-teachers.

A number of means were introduced to address the above, arriving at promising results. The use of math fair, lesson studies, situated learning, ICT, writing, enquiry/problem based learning and reflections are some of them. We observed the influence of the cultural context concerning education or mathematics teaching/learning from different countries or different parts of the world.

A salient focus among the presentations is teacher's knowledge, ranging from subject content knowledge, pedagogical content knowledge to belief. There were discussions on how teacher education programme can strike a balance between the mathematics component and the pedagogical component and how these two can be linked together.

Probably, the use of video in teacher training sessions is revealed as an important tool which could create or contribute to create these links. But we concluded that using video in pre service teacher training is not easy. We need to elaborate research programs to study how it could be possible to develop video based training. There were discussions on the different kinds of video (for example, showing expert or novice teachers, ordinary lessons or experimental), on the different goals (to show, to analyze, to observe the teacher or the students) on the different points of view (the teacher or the students) on the different conditions and on the limits. These remarks led to another issue: how could the teacher trainer introduce and use video to help the pre-service teacher to develop different kinds of knowledge or skill for mathematics teaching? How could the video give some informations on the student learning...

As for the recurrent issue of PCK, it was realised that it is cultural/context and student dependent. In other words, for a single subject matter, it depends on the 'target audience' for searching for the best way to have it presented. Rather than instoring potential teachers with a bundle of PCK (corresponding to a single SK), it might be more realistic and effective to equip them with the ability to adjust the presentation (of SK) spontaneously according to the subtle variations of their students. Again reflection comes into play.

How to build a path from fun to formal mathematics, from elementary mathematics to advanced mathematics is another issue of concern. All these involve all the parties: the student-teacher, the teacher trainer, the mentor and the pupils (during field experience). All these would not only result in reflections among student-teachers, professors and even teacher education curriculum developers should have their reflections too.

Summary

There were a lot fruitful discussions in this topic study group. We appreciated the different topics of the papers. We observed that there were a lot of very interesting issues which are very similar from a country to another and we hope our discussion

will continue to bear fruits and impacts on our future programme for pre-service mathematics education. We learned from the different points of view and the cultural contexts.

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