

Mathematical Knowledge for Teaching at Primary Level

Len Sparrow

Overview

The group generated considerable interest with 30 papers and abstracts being submitted. A review system was established by the TSG 23 Chair Christoph Selter whereby each paper was read and reviewed by one of the Co-Chairs and a Team Member. From this process 19 papers were accepted for presentation in Seoul.

The presentations were given over four days with each day being allocated 90 min in the main program. These sessions were chaired by Len Sparrow with help from Pi-Jen Lin on Day 2. Due to the high number of papers, and a wish of the organising team for as many colleagues as possible to experience presenting at the Congress, paper presentations were short (15 min). Each presentation had an allowance for questions and comments by the TSG participants. Papers were grouped under similar themes so that there was an element of coherence each day. The Chair summarised the issues and questions for each day and presented these to the TSG members for comment at the next session. They are copied below. Attendance at the presentations was typical of such groups with a group of stalwarts attending every presentation and every day while others attended only for their presentation. The group attracted a range of participants from early researchers to highly experienced professors and was enriched by this diversity.

Organizers Co-chairs: Christoph Selter (Germany), Suck Yoon Paik (Korea); Team Members : Catherine Taveau (France), Pi-Jen Lin (Taiwan), Len Sparrow (Australia); Liaison IPC member: Mercy Kazima (Malawi).

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Schedule

Session 1: Tuesday, 10th July, Teachers' mathematical knowledge

10:35 Christine Browning, Understanding Prospective Elementary Teacher Content Knowledge: Common Themes from the Past Decade.

10:50 Siew Yin Ho, Pre-service teachers' specialised content knowledge on multiplication of decimals.

11:05 Pi-Jen Lin, Future teachers' proof of universal and existential elements.

11:20 Di Liu, A comparative study of Chinese and US pre-service teachers' mathematical knowledge of teaching in planning and evaluating instruction.

11:35 Cheng-Yao Lin, Enhancing pre-service teachers' computational skills through open approach instruction.

11:50 Eva Thanheiser, Preservice elementary teachers' understanding of multi-digit whole numbers: Conceptions and development of conceptions.

Session 2: Wednesday, 11th July, Teachers' knowledge about children's mathematical thinking and reasoning.

10:40 Jeong Suk Pang, Novice Elementary Teachers' Knowledge of Student Errors.

10:55 Yusuke Shinno, Issues on prospective teachers' argumentation for teaching and evaluating at primary level: Focussing on a problem related to discrete mathematics.

11:10 Mi Sun Pak, Teachers' knowledge and math teaching in a reform curriculum.

11:25 Mustafa Alpaslan, Preservice mathematics teachers' conceptions regarding elementary students' difficulties in fractions.

Day 3 Friday 13th July—Teachers' beliefs, attitudes and orientations

15:10 Audrey Cooke, Anxiety, awareness and action: Mathematical knowledge for teaching.

15:25 Ronald Keijzer, Mathematical knowledge for teaching in the Netherlands.

15:40 Sharyn Livy, Foundation and connected mathematical content knowledge for second year primary pre-service teachers developed in practice.

15:55 Hyun Mi Hwang, Korean elementary teachers' orientations and use of manipulative materials in mathematics textbooks.

Session 4 Saturday, 14th July, Theoretical conceptualisation of teachers' knowledge

10:40 Minsung Kwon, Mathematical knowledge for teaching in the different phases of the teaching profession.

10:55 Tibor Marcinek, Learning to interpret the mathematical thinking of others in preservice mathematics courses: Potential and limitations.

11:10 Miguel Ribeiro, Teachers' mathematical knowledge for teaching and its role on practice.

11:25 Arne Jakobsen, Using practice to define and distinguish horizon content knowledge.

Summary of Issues Raised in Topic Study Group

Session 1:

- We already know a lot about the content knowledge of preservice primary/elementary teachers in USA.
- Similar information is available from Non-USA countries.
- Generally, they lack deeper forms of conceptual knowledge especially in number related areas.
- What causes these limitations? Procedural teaching? Other?
- What are the consequences of this? Why is it a problem?
- Results in procedural teaching and a continuation of the cycle of procedural teaching?
- What are strategies to overcome this limited knowledge?
- Is it important to overcome these limitations?
- What has already been done? National testing of pre-service teachers in UK—Evidence that it is effective? Teaching primary mathematics content in University programs/courses/units.
- Is this phenomenon in all countries? If not, how are they different? Singapore? China? Finland? Korea?
- What mathematics should pre-service teachers know?
- Should there be an entry standard in mathematics for pre-service primary teachers? If so, what should it be? Higher level mathematics?

Session 2:

- What mathematics should primary teachers know? Pre-service/In-service?
- How will they come to know this?
- How will others know they know?
- Should we employ mathematics specialists?
- How does better teacher mathematics knowledge impact the classroom/children's mathematics learning?
- How will they come to gain knowledge of children's errors, thinking, misconceptions?
- Is it important that primary teachers know about and undertake investigations, proof, explanations in mathematics?

Session 3 and 4:

- Is it possible to teach sufficient mathematics content while teaching about mathematics pedagogy?
- How can you motivate pre-service/in-service teachers to learn the mathematics needed for primary teaching?
- Do teachers need knowledge of how to use materials for teaching mathematics?
- Should we develop teachers' numeracy or mathematical knowledge?

- How do you find out what mathematics pre-service/in-service teachers know/understand?
- Is developing teacher confidence in mathematics the key?
- How can you tell which teachers are in denial or are just unaware of their limited mathematical knowledge?
- What are situations that help pre-service/in-service teachers identify gaps in their knowledge?
- How do you help when you/they spot gaps in knowledge?
- What knowledge do teachers need to make practice ‘mathematically demanding’ and ‘pedagogically exciting’?
- How can one help develop horizon content knowledge?

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