

Topic Study Group No. 26: Research on Teaching and Classroom Practice

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Focus and Themes

This Topic Study Group aimed to improve understanding of the importance, specific nature of, and challenges associated with research on teaching and classroom practice; to promote exchanges and collaborations around the identification and examination of practices in classroom instruction across different education systems; and to enhance the quality of research and classroom practice. Developing systematic research on classroom practice in school mathematics is a relatively new endeavor. In fact, this Topic Study Group was only the third time in ICME history to take a primary focus on classroom practice.

The focus of TSG 26 was discussion of research related to mathematics teaching and classroom practice. Classroom practice includes the activities of teaching and learning located within the classroom. It requires examination of the interactions among the mathematical content to be taught and learned, the instructional practices of the teacher, and the work and experiences of the students within particular educational settings. In these interaction processes, mathematical content is contextualized through situations, the teacher plays an important instructional role drawing on his/her knowledge, and the students involve themselves in the learning processes. Research aims to understand the nature and extent of the interactions, the

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complexity of the didactic system, the roles of the teacher and students in the interaction processes when the mathematical content is taught and learned, and the complexity of the activities in mathematics classrooms. Papers that explore how factors outside the classroom (e.g., school leadership, policies, organizational dynamics) shape instruction inside classrooms are also welcomed.

The TSG26 was intended to provide an international platform for all interested parties (e.g., mathematics educators, school teachers, educational researchers, etc.) to disseminate findings from their research on teaching and classroom practice with the use of various theoretical perspectives and methodologies, and to exchange ideas about mathematics classroom research, development, and evaluation.

Regular Sessions

Regular sessions of TSG 26 were organized into four 90-minute time sessions. **Session 1** was spent for the invited speaker who provides a state of the art presentation.

Invited Lecture was given by Daniel Chazan and Patricio Herbst with a title of “Reconciling two uses of norm in mathematics education research”. They juxtaposed two meanings of norms—norms as sets of expectations deliberately designed by teachers that are co-constructed with students and norms as sets of expectations that come with the canonical uses of curricular tasks. In particular, in the context of a press on mathematics educators to generate instructional improvement, they asked how an understanding of norms associated with canonical uses of tasks might relate to norms that teachers negotiate and co-construct with their students in the context of instructional innovations.

Two theoretical presentations on research on teaching provided the basis for discussion in the following **sessions 2 & 3**.

Session 2 included parallel presentations by the researchers working on research on teacher’s questioning on the one hand and on measuring teaching and classroom practice on the other.

- Esther Alice Enright, Lauren Ashley Hickman and Deborah Loewenberg Ball: A typology of questions by instructional function
- Melissa Kemmerle: Questions about questions: How student questions in mathematics classrooms are affected by authority distribution and assessment practices
- Siún NicMhuirí: Using research frameworks to develop practice: Teacher questions in a math talk community
- Jeremy Zelkowsk, Jim Gleason and Stefanie D Livers presented: Measuring mathematics classroom interactions: An observation protocol reinforcing the development of conceptual understanding

- Lidong Wang and Yiming Cao: Using cognitive diagnostic model to build a differential model to measure mathematics teachers' effect on grade 7 students' achievement

Session 3 included parallel presentations on research on focused on teaching and students' learning and describing and comparing teaching.

- Marika Toivola and Harry Silfverberg
- Amanda Allan, Tina Rapke and Lyndon Martin
- Sharon Marianne Calor, Rijkje Dekker, van Drie Jannet Petronella, Bonne Zijlstra and Monique Volman,
- Emily C Kern, Erin C. Henrick, Thomas M. Smith, Paul Cobb and Yiming Cao,
- Yu Bin Lee, Cheong Soo Cho
- Steven Watson, Louis Major and Elizabeth Kimber

Session 4 consisted of two invited presentations of papers and draw conclusions regarding the state of the art in research on classroom teaching.

Mary Kay Stein, Katelynn Kelly, Debra Moore, Richard Correnti, Jennifer Russel presented their paper entitled as "Theorizing and measuring teaching for conceptual understanding". They described and provided initial evidence for a theory of mathematics teaching and learning that can guide efforts to validly and usefully measure teaching in an era of increasingly ambitious standards for student learning. The theory is based on two constructs that past research suggests foster students' conceptual learning: Explicit attention to concepts (EAC) and students' opportunity to struggle (SOS). By crossing high and low values of these constructs, four quadrants are formed that, we argue, represent four discernable profiles of teaching. Fifty classroom videos of Grades 4-8 mathematics teachers were coded using this theory. Results suggest that not only can teaching be reliably placed into one of the quadrants, but also that quadrant-based teaching was characterized by other teaching practices that we had conjectured would be indicative of high or low EAC/SOS. We close with a discussion of the benefits of using a theory to guide investigations into the relationship between mathematics teaching and learning.

Yoshinori Shimizu and Yuka Funahashi presented their paper entitled as "Beyond the labels: Learning from international comparative studies of mathematics classroom". In this talk, they problematized such labels and discussed possibilities of going beyond them by searching for similarities and differences in educational practices by drawing on the data and analyses from the Learner's Perspective Study (LPS). Two studies are used as cases for illustrating possibilities of identifying similarities and differences in the classroom practices: a comparison of lesson event of teacher's summing up during mathematics lessons in China and Japan, and a comparison of teacher's questioning in Germany and Japan. With the recognition that international comparative studies of classroom practices provide researchers and policy makers opportunities for understanding their own implicit theories about how teachers teach and how children learn mathematics in their own context, this paper emphasizes the importance of taking into account the different

cultural assumptions underpinning teaching and learning in the international debates on mathematics education.

Four broader categories of research areas were identified, “Teacher’s Questioning”, “Measuring teaching and classroom practice”, “Teaching and Students’ learning”, “Describing and Comparing teaching”.

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