

New Perspectives on the Didactic Triangle: Teacher-Student-Content

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Background

What constitutes development when applied to the teaching of mathematics? Responses to this question might focus on the nature of the tasks and activities in which teachers engage their students. The introduction of 'inquiry' tasks, problem solving activities, and open, rather than closed tasks can all be taken as evidence of teaching development, indeed there has, over the past couple of decades, and recently been considerable attention on the nature of tasks in the literature of mathematics teaching development. In classrooms tasks are a 'mediating artefact' used by the teacher with the intention of leading students to develop new understanding or knowing, that is tasks are used in a wider context of teaching. Over a decade ago Stigler and Hiebert (1999) reported on a meeting in which 'distinguished researchers and educators from Germany, Japan, and the United States' were invited to review and discuss the classroom recordings made for the TIMSS video study. One participant shared his reflections after viewing video recordings made in Japanese, German and US mathematics classes thus,

In the Japanese lessons, there is the mathematics on one hand, and the students on the other. The students engage with the mathematics, and the teacher mediates the relationship between the two. In Germany, there is the mathematics as well, but the teacher owns the mathematics and parcels it out to students as he sees fit, giving facts and explanations at just the right time. In the U.S. lessons, there are the students and there is the teacher. I have trouble finding the mathematics; I just see interactions between students and teachers. (Stigler & Hiebert 1999, p. 25-26)

We were reminded of the above recently while analysing some episodes of mathematics teaching in which the teachers claimed to be using inquiry, and open tasks. It appeared that the teachers were in control of the mathematics, which was parcelled up into manageable chunks and presented to the students, much as the viewer above noted in the German classes.

How might teachers be empowered to become aware of and work on relationships between themselves (the teacher), their students and the mathematics?

The question above is based on the notion of a 'didactical triangle' (mathematics, student, and teacher) that lies at the heart of the concerns addressed in mathematics teaching developmental research. It is evident in the 'teaching triad' (management of learning, sensitivity to students, mathematical challenge) proposed by Jaworski (1994), and for example in Brousseau's (1997) theory of didactical situations in which the teacher sets out to create a milieu in which the students engage with the mathematics in an adidactical situation. Research and development activity that has focused on problem solving, inquiry and investigation, use of digital technologies in mathematics teaching, and teachers' engagement with pupils in classes is fundamentally concerned with students' engagement with mathematics, and the mathematical challenge they experience. Researchers taking these issues as the focus for their inquiries are able to address the fundamental relationships within this didactic triangle.

This proposal for a special issue of ZDM is intended to bring together leading researchers and thinkers in the field of mathematics education to address, from the perspective of their own research the relationships between mathematics, student and teacher.

- *How does/can the introduction of inquiry or investigational tasks impact upon the relationships within the didactical triangle?*
- *How does/can the development of a problem oriented approach to mathematics teaching and learning affect the relationships within the didactical triangle?*
- *How does/can the introduction of digital technologies to teaching and learning mathematics affect the relationships within the didactical triangle? Does the technology introduce another 'vertex' such that it is necessary to refer to a didactical quadrilateral?*
- *How do/can teachers transform the relationships between mathematics, students and themselves?*
- *How can those working in teaching development projects influence teaching so that teaching, and the didactical relationships are accommodated to new artefacts (inquiry tasks, problems, ICT, etc?).*

It is also hoped that the special issue will also include contributions of empirical studies from research groups in Norway.

Contributors to this special issue

Professor Kenneth Ruthven, University of Cambridge UK (teachers and learners use of digital technologies)

Professor Alan Schoenfeld, University of California, Berkeley USA (problem solving, teacher decision making)

Professor Barbara Jaworski (University of Loughborough, UK) (inquiry in mathematics teaching and learning development).

Professor Patricio Herbst (University of Michigan, USA) (theoretical perspective on the didactic triangle)

Professor Kyeonghwa Lee (Seoul National University, Korea) and Professor Bharath Sriraman (The University of Montana) (pedagogy of silence in the didactic triangle)

Possible Norwegian contributions from

Claire Berg, Anne Berit Fuglestad and Simon Goodchild (University of Agder) (mathematics teaching developmental research – secondary focus)

Martin Carlson, Ingvald Erfjord and Per Sigurd Hundeland (University of Agder) (mathematics teaching developmental research - pre-school focus)

Raymond Bjuland (University of Stavanger) (teaching and learning mathematics in primary school)

Heidi S. Måsøval (University College of Sør Trondelag) (Applying theory of didactical situations to analyse teaching and learning – mathematics teacher education)

It is hoped that the combination of contributions as set out above will bring forth reports on empirical studies and some theoretical/philosophical analyses.

Proposed time line

April 01, 2011 First draft of papers sent out for review

May 16, 2011 Reviewers comments sent to authors for revision

June 15, 2011 Second draft papers – sent for further review/editorial review check

August 16, 2011 Reviewers comments sent to authors for revision

September 30, 2011 Final Papers sent to ZDM

December 2011, Publication date.