Working group 8 brought together papers focusing on social interaction within a wide range of mathematical learning situations. The group received, reviewed, modified and accepted seven papers, while the working group extended to seventeen members, three of whom had submitted relevant posters. In addition, Bertolini Bussi and Krummheuer each presented work to initiate discussion about the methodology of research in classrooms, though these are not included. While the majority of the papers presented work in its completed or almost complete state, two papers, Fetzer and Schreiber, presented early stages of work in progress.

The papers and posters covered the learning of mathematics by a range of learners from four-year-old children to university engineering students; analytical studies and intervention studies, including teaching experiments; arithmetic, algebra, geometry, and the use of technology, indicating the number of potential links with other working groups at the conference. What brought us together was an interest in analysis of social interaction within these learning situations.

Within, and in addition to, the discussion of these papers the group also set out to discuss the methodology of research into social interaction from the theoretical frameworks of its members. Different theoretical approaches discussed included:

- Discursive Psychology,
- Situated Cognition,
- Activity Theory,
- Social practice theory,
- Linguistic analysis,
- Semiotic Mediation, and
- Metacognition.

The papers were all therefore very different, yet we were able to organise comparisons to bring ideas closer together.

Several key ideas recurred throughout our discussion of the papers. The first was that of communicating mathematics. Fetzer’s paper describes the development of a framework to analyse the relationship between oral and written mathematics using Bruner’s idea of ‘œuvres’. This enables her to see where the children move from the recording of mathematics to the concentration on the form of writing. In a similar
way, Schreiber’s paper shows how children in a computer ‘chat’ environment develop their mathematics through communication. These ideas forced us to consider the form and context of communication across the other papers.

A second theme concerned the linking of mathematical concepts to the context in which they are framed. So, Cerulli’s work on L’Algebrista shows how the teacher and children moved between the mathematical world of the classroom and that of the computer programme, in the language that they use to communicate their mathematical ideas. While in the classroom they talk ‘as if’ they are involved in the computer programme, allowing them to develop algebraic concepts more effectively. The language of the programme provides a metaphor for the mathematics. Similarly, Schwarzkopf looks at the way children use their knowledge of mathematics and the real world in solving word problems. Here the children appear to look for a link between the story or the physical representation of the story (sketch) and the mathematics, trying to make sense of the context that is unfamiliar to them.

The development of shared practice describes a third theme. Barwell also considers word problems but for the perspective of discursive psychology. The building of a shared discourse between teacher and pupils enables their problem solving. Price develops the ideas of shared discourse, drawing on social practice theory to consider the classroom as a community of practice. Children involved in communal acts of mathematics, for example counting aloud together, achieve mastery through legitimate peripheral participation. While these two papers come from different theoretical perspectives, the role of the teacher in developing a shared practice emerges from both. Kramarski and Mevarech set out to compare the achievement of student’s mathematical discourse with or without training in metacognitive discourse, showing that, where the students were made aware of problem solving strategies, while working on cooperative tasks, they were able to interpret and construct graphs more effectively. Drawing on Cobb (1995) they conclude that ‘metacognitive questions enrich the taken-as-shared meaning in an interactive way.’

In the posters, Anderson studied the communication among engineering students jointly constructing concept maps in Linear Algebra. Four groups (3 students in each group) from a Swedish university were videotaped while constructing concept maps. The initial results have been outlined.

Gallopin reported from a laboratory study “Mathematics on the river banks,” in which primary and secondary school students were engaged in a co-operative learning environment. The older students had to explain some topics from Egyptian and Babylonian Mathematics to younger pupils.

Maschietto and Ferri presented a teaching experiment, which started with Grade 4 students and is currently being carried out in a 5th Grade classroom (primary school). It is about the Desarguesian form of geometry, and centres on the study of cognitive processes of semiotic mediation through the use of perspectographs as tools.
The outcome of the whole group was not, nor was it intended to be, one single theory, but the individual development and refinement of theoretical ideas. The topics within mathematics and mathematical learning appeared in different forms and from different perspectives. At times we were challenged by an aspect of social interaction arising from one paper, to consider this aspect in other work. An example of this was the use of chat language in Schreiber’s paper which drew us into looking at forms of language for different purposes in other papers. However we concluded that different approaches are not only allowable but are essential for helping to describe social interaction in mathematical learning situations, because of their inherent complexities.

Finally, the working group concluded by raising a number of questions for further consideration;

It is sometime difficult to focus on the social interaction without losing a focus on the learning of mathematics. We have to ask ourselves whether a particular theoretical perspective enlightens our understanding of mathematics learning. How can we continue to look at social interaction and use theory to analyse this interaction without losing sight of the mathematics being learnt?

Several members felt that applying for research grants in this area was difficult, because of the necessity for a qualitative rather than quantitative research paradigm. Therefore, how can we clarify, for the empirical science learning community, the need for a methodology which is logically related to the practice that is under investigation?

To what extent is it possible to analyse the same learning episode from a range of different theoretical perspectives in order to help us to cope with the complexity of the situation?

Perhaps this last question could be a starting point for the group for CERME 4?

List of contributions

List of Thematic Groups