

## **INTRODUCTION**

### **COMPARATIVE STUDIES IN MATHEMATICS EDUCATION**

#### Organisers

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#### **AIMS AND SCOPE OF THE WORKING GROUP**

The call for papers for the 2009 meeting of the working group set out with a description of the scope and aims of comparative studies in mathematics education. These include studies that document, analyse, contrast or juxtapose similarities and differences in mathematics education at different levels, such as:

- cross-cultural or cross-national comparison;
- comparison between sectors of school-systems;
- comparison between groups that share specific characteristics (for example, gender, language, social and economic background, cultural affiliation or other demographic features);
- comparing mathematics education with other school subjects.

There were no restrictions in the aspects of mathematics education that can be usefully addressed in a comparative study. These might, for example, include: Intended curricula; tools, teaching materials and resources; specific mathematical activities or the enactment of distinct mathematical topics; learning environments; teachers', student teachers' and students' aspirations, goals and values; student achievement and participation; features of classroom practices or features of teacher preparation programs.

The aims of the working group included to:

- share findings and outcomes of empirical studies that adopt a comparative approach;
- further develop research methodologies that are specific to comparative studies;
- identify ways in which macro-level survey studies and micro-level case studies can productively interact;
- develop a better understanding of how various theoretical approaches and conceptual frameworks shape the goals and the design of comparative research;
- consider how comparative studies can inform teaching and learning practices.

The group invited contributions with an empirical, methodological or theoretical focus. Papers with a methodological or theoretical focus could, for example, address issues of comparability of culturally-grounded practices, challenges of interpreting

outcomes of large-scale international achievement studies, methods of data aggregation in quantitative studies, technicalities of classroom-video studies, issues of cultural bias in coding or any other problématique that is specific to comparative studies.

## PAPERS AND POSTERS

As the working group brings together researchers who share an overall approach rather than a focus on a set of topics, we find an interesting range of aspects of practices in mathematics education that were subjected to comparison in the research reports and posters. The participants' studies, some of which are ongoing projects, addressed mathematics education in different places of the world. The countries and regions include Australia, China, the Czech Republic, Finland, France, Germany, the Hong Kong Special Administrative Region, Hungary, Israel, Italy, Norway, the Slovak Republic, Syria, the United Kingdom of Great Britain and the United States of America. The titles of the papers and posters indicate the variety of aspects of mathematics education that were subjected to a comparison (presenting authors are underlined):

Paul Andrews, United Kingdom: *Comparing Hungarian and English mathematics teachers' professional motivations*

David Clarke and Xu Li Hua, Australia: *Spoken mathematics as a distinguishing characteristic of mathematics classrooms in different countries*

Tiruwork Mulat and Abraham Arcavi, Israel: *Mathematical behaviours of successful students from a challenged ethnic minority*

Giancarlo Navarra, Nicolina A. Malara, Italy; András Ambrus, Hungary: *A problem posed by J. Mason as a starting point for a Hungarian-Italian Teaching Experiment within a European project*

Hans Kristian Nilsen, Norway: *A comparison of teachers' beliefs and practices in mathematics teaching at lower secondary and upper secondary school*

Birgit Pepin, United Kingdom/ Norway: *Mathematical tasks and learner dispositions: A comparative perspective*

Jennifer von Reis Saari, United Kingdom: *Elite mathematics students in Finland and the Washington: Access, collaboration, and hierarchy*

Constantinos Xenofontos, United Kingdom: *International comparative research on mathematical problem solving: A framework for new directions*

As the posters are not included in the proceedings, short summaries are given in the following:

Maha Majaj, France: *Comparative study of the place of elementary number theory in the programs and the textbooks in the middle school between France and Syria*

The teaching of elementary number theory has undergone changes in the French and Syrian education systems. In Syria, its place changed with the evolution of the textbooks about five years ago and in France it was reintroduced, after fifteen years of absence, in 1998 (grade 12), 1999 (grade 9) and 2001 (grade 10). The study compares elementary number theory in the programs and textbooks, topic by topic, by taking into account a distinction between tool and object and identifies the didactical transposition choices and their effects on the design of textbooks. An initial study indicated that the choices of the Syrian educational system can be seen as corresponding to the French program since the beginning of the 20th century. This observation led to including an analysis of the evolution of the French program and textbooks from the reform in 1902 onwards.

Jan Sunderlik, Slovak Republic: *Intrinsic motivation and student teaching practice at universities from Great Britain, the Czech Republic and the Slovak Republic*

The study in progress sets out to investigate pre-service teachers' teaching practice in Great Britain, the Czech Republic and the Slovak Republic with a focus on their strategies for motivating students. It is to understand how the accumulated body of research on students' motivation may be useful for classroom teachers struggling with the issue. The notion of motivation is complex and, for example, described as linked to social needs, beliefs, behaviour and affect. One challenge of the research is to describe motivation in observational terms.

## **SNAPSHOTS AND CLOSEUPS FROM THE DISCUSSION**

The groups at the CERME adopt a mode of working that assumes that all papers have been read before the start of the conference. The presenters in our group were invited to draw our attention to specifics and to expand on one or two points in order to provide us with 'an experience' for entering the discussion. The productive work and stimulating discussion lived on the continuous engagement of all participants, which made it possible to allude to a wide range of topics. In the following, a summary of some issues, which were not specific to a particular research report, is given.

### **Agendas and modes of comparison**

The group agreed that although comparative studies serve to achieve a variety of goals, comparison does not itself constitute the goal of a comparative study. Comparison was seen as being always of interest because looking at practices from another culture (see below "units of comparison") provides a new 'lens' for looking at our own; it helps to make the familiar look unfamiliar. For the activity of describing similarities and differences in the empirical findings, the metaphor of "collecting stamps" was introduced. Synthesis was seen as a more far reaching goal of a comparative study than a mere description of similar and different aspects, and comparison was described as "the fuel of synthesis". A comparative approach can also aim at assisting theory construction. It is useful for this purpose especially because the emergence of differences supports cultural explanations, while similarities suggest structural (sociological) interpretations. While the improvement

of “home” teaching practice was seen as an important goal for a cross-national or cross-cultural comparative study, the members of the group agreed that not all research in mathematics education has to be advocacy.

### **“Units of comparison”**

Acknowledging that all empirical research has a comparative aspect, one recurring point in the discussion concerned the question, are there ‘units’ for comparison that are too small or too big for allowing a study to be described as comparative. Agreement was reached that comparison has to be between aspects of “social conglomerates”, between two cultures (with shared discourse and identities). Just the fact that members of a group share an attribute does not mean that their membership of the group is related to that attribute, neither as a condition for or a consequence of that membership.

Examples of “units for comparison” discussed in relation to the research reports were: curriculum, ideologies in education, schools, processes of change, students’ productions, lesson structure, lesson events, groups of students in different institutional cultures, groups of successful and unsuccessful students from the same culture.

### **Methodology and Methods**

Many problems identified in the discussion are not specific to comparative research, but the challenge of working across cultures makes them more visible. The research designs in the comparative studies presented in the group comprise a variety of approaches for creating accounts of the practices to be compared. The discussion focused on three approaches: documentation, cross-national intervention study (a “perturbation of practices”) and on the comparison with a different teaching practice (with a different pedagogy) as a quasi-experimental design.

### **Interpreting “silence in the data”**

This discussion emerged out of an example of interview transcripts with students from two different cultures. The participants did not say anything after a prompt from an interviewer. In the group we created several interpretations of this fact: Silence is a normal part in any conversation – it is a thinking pause; silence is a sign of cultural or social alienation; silence is a general cultural behaviour; silence is an individual’s preference.

In the course of the discussion, “silence” was used metaphorically for missing aspects of a practice. These silences go unrecognized from within the practice and thus comparison can fill the gap left by silence.

### **To what extent are the outcomes comparable and can be synthesised?**

Group members observed that the cultural differences sometimes are so fundamental that comparison is impossible. The results can then only be juxtaposed. The question

was also asked to what extent psychological frameworks could be useful in comparing groups from different cultural contexts.

### **Cultural affiliation of research personnel (interviewers, transcribers)**

Group members were aware that inter-researcher reliability is a problem in all studies, but it is likely to be exacerbated in a cross-cultural comparative study or a study of different institutional cultures or any other social conglomerates with a shared discourse. Some methods were suggested and discussed. “Member checking” includes exchanging the accounts between the different communities (both the “researched” or the researchers’) and letting them check from their lens. One interesting example was provided in a study in which teachers in one country had been asked to read the accounts from teachers in other countries of what they do and why they do it.

### **How to avoid a culturally biased interpretation?**

Group members shared the observation that interpretations are loaded with values from our own teaching tradition as well as research tradition. Researchers may project their home-grown categories into the other culture’s data, which amounts to a culturally biased gaze. Researchers might as well be at risk to produce an ‘idealistic’ description of their own practice, or alternatively (depending on the culture!), provide an account that is too critical of the home practice and celebrates the other.

The group found that exploiting different conceptual frameworks might help to identify the blind spots of each. The French “praxeology” served as an example. Some found that ‘contextualised tasks’ were not given attention as a category because the French curriculum does not include those as a characteristic element. In an approach that is more focused on the empirical material and does not set out with theoretical categories, the interpretative accounts for one set of data from one site maybe considered as the framework for interpreting the other (and vice versa). This approach is reminiscent of constant comparison as a standard method in qualitative data analysis.

All agreed that language matters, also within a culture, e.g. as a sociolect, as difference between formal and informal language use. This point draws attention to how to deal with translated transcripts; the choice of language into which protocols are translated is already a source for a cultural bias. The group pointed to the need of defining the cultural frame of each report.

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