The International Commission on Mathematical Instruction: a centenary of history and a future to construct

Between the 5th and the 9th of March 2008 there was held a very special symposium in Rome: *Reflecting and shaping the world of mathematics education. The first century of the International Commission on Mathematical Instruction (1908–2008)*. Organised in collaboration between ICMI and an Italian committee with Ferdinando Arzarello on the lead, the symposium took place at the Accademia Nazionale dei Lincei, the very same place where hundred years ago a selected group of members of the International Mathematical Union decided to engage in the creation of ICMI.

The symposium gathered around 200 invited participants from 43 countries around the world. It intended to present a historical look at the formation and evolution of ICMI during the first century of its existence, and reflect about the status of mathematics education research and envision its future. The symposium had a series of activities: eight plenary addresses with a reaction, eight parallel short talks, and five working groups with a series of short papers as a basis for discussion. For more details about the symposium, program and papers consult http://www.unige.ch/math/EnsMath/Rome2008/.

Participating in this event was an enriching opportunity and we would like to share with NOMAD readers some of the main points that, in our perspective, were prominent issues of this important symposium. We will shortly touch upon what is ICMI, some of the characteristics in its first hundred years, the role of the Nordic countries in ICMI, and some of the challenges for the future.

What is ICMI?

ICMI is an official commission of the International Mathematical Union, IMU. ICMI was first established at the International Congress of Mathematicians held in Rome in 1908, on the suggestion of David Eugene Smith, American mathematician and historian of mathematics. The first President of ICMI was Felix Klein, and Henri Fehr was the first Secretary-General.

ICMI members are both the countries belonging to IMU, and some countries which do not belong to IMU but who show special national interest in the organisation of mathematics education. Member countries have national ICMI commissions with at least an appointed national representative.

ICMI has played an important role in being an international organisation for promoting initiatives for the improvement of mathematics education in its member countries, through the maintenance of a series of activities (for further details about the following activities consult http://www.mathunion.org/ICMI):

- L' Enseignement Mathématique, the official organ of ICMI.
- ICMI bulletin and the new electronic ICMI News.
- ICMI Awards, through the Felix Klein Award which honours a lifetime achievement, and the Hans Freudenthal Award which recognises a major cumulative program of research.
- ICMI Studies aiming at fostering efforts around the world to improve the quality of mathematics teaching and learning, though the growth, synthesis, and dissemination of new knowledge (research) and of resources for instruction (curricular materials, pedagogical methods, technology, etc.).
- The International Congress on Mathematics Education (ICME), a quadrennial event gathering the international community of mathematics education around the world.
- ICMI five affiliated permanent study groups: The International Study Group on the Relations between the History and Pedagogy of Mathematics (1976), The International Group for the Psychology of Mathematics Education (1976), The International Organization of Women and Mathematics Education (1987), The World Federation of National Mathematics Competitions (1994), and The International Study Group for Mathematical Modelling and Applications (2003).
- Regional conferences series such as the AFRICME and SEAME.

Some highlights on ICMI's history

At the symposium there was a series of plenary lectures aiming at presenting the history of ICMI from different perspectives and based on

original documentation. Hyman Bass (the former president of ICMI) presented an overview of the century of ICMI. The first fifty years were characterised by the initiatives of the founding fathers, a reduced group of mathematicians who had a commitment to the improvement of mathematical instruction. At the beginning of the 20 th century schooling was only provided for a selected social and economic elite, and mathematics education was mainly discussed in terms of the content and organisation of the curriculum relevant for the education of that minority. A main figure in this period was Felix Klein who was a strong advocator for a renewing of mathematics curricula with more emphasis on the process of doing mathematics in the classroom. Bass named this period the "Klein era". In his plenary talk, Gert Schubring provided a detailed account of this period, of the types of collaboration among the first interested actors and of the conflicts emerging as a result of participants' engagement in World War I and II, leading to the dissolution of the commission in between wars.

The following 50 years staring from the rebirth of ICMI in 1952, began thanks to the initiative of Hans Freudenthal (president of ICMI 1967–1971). With the expansion of education to the masses and the influence of Freudenthal's thinking, the didactical aspects of the teaching and learning of mathematics started to be central concerns of ICMI. The beginning of the "Freudenthal era", as named by Bass, was heavily influenced by the New Math reform of which Freudenthal was a very strong opponent. In their plenary talk, Fulvia Furinghetti and Martha Menghini presented details of the renaissance in the Freudenthal era, highlighting the important new organisational initiatives in this period such as the formation of the international journal *Educational Studies in Mathematics* and the launching of the ICMEs, the affiliated study groups (HPM and PME in 1976) and regional conferences.

Through out the history of ICMI the relationship to IMU on the organisational level and in general the relations to the mathematics community have played a significant role, sometimes of positive synergy and some other times of conflict. Until recently, the IMU general assembly elected the president and executive committee of ICMI. The presidents in the past have all been well respected male mathematicians and ICMI has never had a president with mathematics education as his main research area. However, at the election in 2007, Michèle Artigue became president of ICMI. With the election of a woman mathematics educator these traditions had been changed and a new era – the "Artigue era", in Bass' words – is beginning. Moreover, due to the persistent work of Hyman Bass during his presidency, the election regulations were revised so that ICMI's general assembly is now the legitimate voting body for the election of all ICMI officers.

In her closing address Michèle Artigue spoke about ICMI as an interface between mathematics education and mathematics or mathematics educators and mathematicians and expressed her visions for a fruitful interplay between mathematics and research in mathematics education for the mutual benefit. Mathematics education research has actually a much more to offer to the mathematics community, other than providing conditions for students to appreciate mathematics, developing adequate competencies for further studies in mathematics, and supporting the development of mathematics teaching at university level. Mathematics education research is contributing to the pool of mathematical knowledge with research on the nature and functioning of mathematics in education and in society.

The Nordic participation in ICMI

Nordic mathematics education research was well represented at the conference both in terms of number of participants (Denmark 5, Finland 1, Norway 2 and Sweden 3) and in terms of involvement in the scientific program. Mogens Niss was member of the International Program Committee for the symposium and he gave a plenary lecture on the balance between application and modeling, and 'pure' mathematics in the teaching and learning of mathematics. Barbro Grevholm was co-chairing the working group on the professional formation of teachers together with Deborah Ball. Morten Blomhøj contributed to a closing plenary panel on challenges for ICMI in the future. All the other Nordic participants presented papers in their working groups. The papers can be found at the conference web-site.

In the account for and discussion of the history of ICMI, Nordic researchers where mentioned prominently in two different contexts. Bent Christiansen (1921–1996), the first professor in mathematics education in Denmark and in the Nordic countries, was especially mentioned for his commitment to mathematics education research and for his work as a vice-president for ICMI for more than ten years in the period 1976–1988. Also Mogens Niss was acknowledged for his achievements during his two periods as the Secretary-General for ICMI, in particular for having being a key figure in the publication of the ICMI-studies reports as a collection at Springer Publishers.

The socio-political dimension in mathematics education research was pinpointed by Jeremy Kilpatrick in his plenary talk as one the most important recent developments in our field of research. Stieg Mellin-Olsen (1939–1995), who was one of the two founding editors of NOMAD (together with Göran Emanuelsson) was recognised as a pioneer in the area, and the work of Ole Skovsmose on critical mathematics education

was pointed out to be the break through for the recognition of the socio-political dimension in mathematics education research.

The challenges towards the future of ICMI

In the closing panel on challenges for ICMI in the future, a number of pending problems for mathematics education research were mentioned and it was briefly discussed what ICMI could do in relation to these challenges. These are some of the major challenges discussed:

- the need of keeping the meta-reflections on the nature and status of our research field alive,
- the need of developing and maintaining good relations with mathematics,
- the need of improving teacher education and teachers' professional development,
- the need of strengthening the interplay between research and the development of mathematics teaching practices, and
- the need of working actively for reaching mathematics education for all.

We see that these global challenges are also challenges for the Nordic region. A testimony to that is the fact that, in one way or another, these challenges have been addressed either explicitly in our editorial comments, in papers and in the special issues of NOMAD in the last three years. The issue of mathematics education for all opens for the need of thinking about new research approaches and the concern for new topics and areas of research. We would like to remind our readers about the coming thematic issue for the present volume, which will address exactly the challenges of (multi)culturality and diversity in mathematics education, an important aspect of mathematics education for all. We encourage submissions to this issue and remind you the deadline of August 15th.

About this number

In this issue we publish three papers, all reporting on empirical investigations but from different perspective and for different groups of students.

The paper *Word problems in upper secondary algebra in Sweden over the years 1960–2000* by Teresia Jakobsson-Åhl reports results from a study on school algebra at the upper secondary level. The study considered

changes in the algebraic content as it was presented in mathematics textbooks in the second half of the twentieth century in Sweden. The paper describes the changes of word problems in terms of the way they are used for developing algebraic skills. It is shown in what ways the place of the problems, the context and the use of mathematical models changed in the period in question. The use of word problems is related to the curricular documents of the time and to different views on school algebra.

In her paper *Växelverkan mellan intuitiva idéer och formella resonemang* Kerstin Pettersson analyses the work of a group of first year university students' formulating and proving a conjecture concerning the relation between the n-derivative of a function being without zeros and the largest possible number of zeros for the function itself. The students were prompt to use an induction proof to prove their conjecture and this seems to have facilitated a rich interplay in the students' work between intuitive ideas and formal reasoning. By means of intentional analysis of a nearly two-hour video recording of the students' work, which is documented in the paper through rich transcripts, Kerstin Pettersson shows how various forms of interplay between intuitive understanding and formal reasoning serve as resources in the students' problem solving process. The learning potentials of the interplay between intuition and formal reasoning are analysed in relation to the particular mathematical content. As a case study the paper illustrates the importance of intuition for the learning of mathematics and it rise interesting questions concerning how to facilitate the students' interplay between intuitive ideas and formal reasoning when teaching mathematics.

Joakim Samuelsson, in his paper C*lassroom settings, self-regulated learning skills and grades in mathematics*, addresses the issue of the plausible influences on students' self-regulated learning skills. This study concentrates on the contextual aspects of the educational preconditions. The group climate seems to be the most influential factor to students' self-regulated learning skills in mathematics. A supportive climate is related to the view of mathematics as something important, while a non-supportive climate is related to difficulties in mathematics. Students with difficulties in mathematics are affected by classroom settings that they perceive as demanding in terms of objectives, and in teacher centred instructions. To some students, high demands, distinct information and invitations to participate can result in positive relationships with mathematics. However, the same conditions can create difficulties in mathematics among other students.

The editors