

Main component of the scientific programme of ICME-10

About the scientific programme of ICME-10

The International Programme Committee (IPC) for ICME-10 would like to extend its warmest greetings to all readers of the First Announcement. The IPC is doing its very best to put together a rich, varied and multi-faceted scientific programme for the Congress, with the aim of attracting and addressing the entire community of researchers and practitioners in mathematics education all over the world. It is our ambition to provide food for thought and inspiration for mathematics practice to the established mathematics educator of world renown and to the novice in the field attending an ICME for the very first time, and to everyone else who takes an interest in mathematics education.

In the programme structure of ICME-10, we have attempted to combine the best of the traditional components which have served to make the past ICMEs the great successes they were, with a number of new components and features which are intended to accommodate new needs and to address the changes that mathematics education as a field of research, development, and practice is currently undergoing.

The main components of the scientific programme are outlined below. A few others are likely to be added at later stages. In this Announcement, no names of speakers or group organisers will be given. As soon as decisions have been made and invitations accepted, names will appear on the ICME-10 web site. Readers are invited to consult this site for updates. Questions and proposals concerning matters pertaining to the programme should be addressed to the Chair of the IPC.

The observant reader will notice that certain themes are dealt with in several different programme formats. This is deliberate, and reflects the expectation that these themes will appeal to different categories of delegates and therefore call for a variety of different approaches.

We, in the IPC, look forward to welcoming you to ICME-10.

Mogens Niss, Chair of the International Programme Committee

The Members of the International Programme Committee

Jill Adler, University of Witwatersrand, Republic of South Africa

Abraham Arcavi, Weizmann Institute of Science, Israel

Michèle Artigue, University of Paris 7, France

Bill Barton, University of Auckland, New Zealand

Hyman Bass, University of Michigan, Michigan, USA - Member Ex Officio, President of ICMI

Christer Bergsten, University of Linköping, Sweden

Ole Björkqvist, University of Åbo – Vasa, Finland

Morten Blomhøj, Roskilde University, Denmark - Chair of the Local Organising Committee

Marcelo de Cavalho Borba, State University of São Paulo at Rio Claro, Brazil

Mariolina Bartolini Bussi, University of Modena, Italy

Nikolai Dolbilin, Steklov Institute of the Russian Academy of Science, Russia

Joan Ferrini-Mundy, Michigan State University, Michigan, USA

Hiroshi Fujita, Tokai University, Japan

Gunnar Gjone, University of Oslo, Norway

Bernard Hodgson, Laval University, Québec, Canada - Member Ex Officio, Secretary of ICMI

Suat Khoh Lim-Teo, National Institute of Education, Singapore

Mogens Niss, Roskilde University, Denmark – *Chair of the International Programme Committee*

Kyungmee Park, Hongik University, Korea

Teresa Rojano, Cinvestav, Mexico

Wilfried Schmid, Harvard University, Massachusetts, USA

Yuxin Zheng, East China Normal University, China

Plenary activities

Plenary activities

The plenary activities are those components of the scientific programme that address all Congress participants at the same time. For ICME-10 there will be a variety of 7-8 plenary activities. These will include plenary *lectures*, two of which will present the outcomes of the work of two of the Survey Teams (see below). There will be a panel *debate* on the theme "Mathematics education for whom, and why? The balance between mathematics education 'for all' and 'for high level mathematical activity'". Finally, there will be an *interview session* during which four senior mathematics educators will be interviewed by an expert about their perceptions and views of the development of mathematics education during their lifetime.

So far, Professors *Jill Adler* (Johannesburg, South Africa), *Ferdinando Arzarello* (Torino, Italy), *Hyman Bass* (Ann Arbor, MI, USA) and *Andreas Dress* (Bielefeld, Germany) have accepted the invitation to give *plenary lectures*. Here, Jill Adler will present the outcomes of the work of the Survey Team 3, "The professional development of mathematics teaching", for which she is the Chair.

The *panel debate* will be moderated by Professor *Stephen Lerman* (London, UK).

In the *plenary interview session* Professor *Michèle Artigue* (Paris, France) will interview Professors *Ubiratan D'Ambrosio* (São Paulo, Brasil), *Gila Hanna* (Toronto, Canada), *Jeremy Kilpatrick* (Athens, GA, USA), and *Gérard Vergnaud* (Paris, France).

ICME-10 Survey Teams

As an innovative feature of ICME-10, it has been decided to appoint a number of small ICME-10 Survey Teams. Each team will work until the Congress surveying the state-of-the-art with respect to a certain theme or issue, with particular regard to identifying and characterising important new knowledge, recent developments, new perspectives, and emergent issues. The outcomes of the work of each Survey Team will be presented in a plenary or a regular lecture at the Congress. The themes are:

ST 1: The relations between research and practice in mathematics education

ST 2: Reasoning, proof, and proving in mathematics education

ST 3: The professional development of mathematics teachers

ST 4: The shaping of mathematics education through testing

ST 5: Information and communication technology in mathematics education

The creation of these teams is intended to strengthen the emphasis on new developments and progress in the Congress programme since the last ICME.

Regular Lectures

On invitation from the IPC, there will be a number of regular lectures given by prominent mathematics educators from different parts of the world. The lectures will cover a wide spectrum of topics, themes, and issues.

Topic Study Groups

As the name suggests, a Topic Study Group is designed to gather a group of Congress participants who are interested in a particular topic in mathematics education. The word ‘study’ suggests that the activities of the groups will include presentations and discussions of important new trends and developments in research or practice related to the topic under consideration. Each Topic Study Group will be organised by prominent experts in the field with the purpose of providing both an overview of the current state-of-the-art in the topic, and expositions of outstanding recent contributions to it, as seen from international perspectives. By their very nature, some of the topics are focussed more on research than on practice. For others the opposite will be the case, whereas several topics will have a fairly equal balance of the two foci.

To some extent, a number of the topics in the list for the Topic Study Groups have mutual overlaps with other topics. Even so, each topic has a well-defined and specific ‘centre of gravity’ that makes it clearly discernible from the others in the list.

The list of topics is organised into four clusters. The first cluster, TSG 1-7, consists of Topic Study Groups that focus on the target groups of mathematics teaching as reflected in educational levels and special categories of students. The next cluster, TSG 8-21, focuses on matters and issues pertaining to content-related aspects of mathematics curricula, across educational levels, and to teaching and learning in relation to those aspects. The cluster formed by TSG 22-27 deals with the overarching perspectives and facets of mathematics education that are present across different educational levels and different curricula. Finally, TSG 28-29 are the Groups in which meta-issues concerning mathematics education itself, as a field of practice and a discipline of research, are the focus of attention.

TSG 1: New developments and trends in mathematics education at pre-school and primary levels

TSG 2: New developments and trends in mathematics education at the secondary level

TSG 3: New developments and trends in mathematics education at the tertiary level

TSG 4: Activities and programmes for gifted students

TSG 5: Activities and programmes for students with special needs

TSG 6: Adult and life-long mathematics education

TSG 7: Mathematics education in and for work

TSG 8: Research and development in the teaching and learning of number and arithmetic

TSG 9: Research and development in the teaching and learning of algebra

TSG 10: Research and development in the teaching and learning of geometry

TSG 11: Research and development in the teaching and learning of probability and statistics

TSG 12: Research and development in the teaching and learning of calculus

TSG 13: Research and development in the teaching and learning of advanced mathematical topics

TSG 14: Innovative approaches to the teaching of mathematics

TSG 15: The role and use of technology in the teaching and learning of mathematics

TSG 16: Visualisation in the teaching and learning of mathematics

TSG 17: The role of the history of mathematics in mathematics education

TSG 18: Problem solving in mathematics education

TSG 19: Reasoning, proof, and proving in mathematics education

TSG 20: Mathematical applications and modelling in the teaching and learning of mathematics

TSG 21: Relations and links between mathematics and other subjects of science or art

TSG 22: Learning and cognition in mathematics: Students' formation of mathematical conceptions, notions, strategies and beliefs

TSG 23: Education, professional life and development of mathematics teachers

TSG 24: Students' motivation and attitudes towards mathematics and its study

TSG 25: Language and communication in mathematics education

TSG 26: Gender and mathematics education

TSG 27: Research and development in assessment and testing in mathematics education

TSG 28: New trends in research in mathematics education as a discipline

TSG 29: The history of the teaching and learning of mathematics

Discussion Groups

As their name suggests, the Discussion Groups are designed to gather Congress participants who are interested in discussing, in a genuinely interactive way, certain challenging or controversial issues and dilemmas - of a substantial, non-rhetorical nature - pertaining to the theme of the Discussion Group. More specific issues and questions for a Discussion Group will be identified by its organisers, and participants in the Group will be invited to propose responses to the issues thus raised, including answers to specific questions, and possibly recommendations to relevant categories of policy or decision makers. There will be no oral presentations in a Discussion Group, except as an introduction by the organisers of the Group to provide the background and framework for the discussion. Information or position papers are expected to be made available to Group participants electronically prior to the Congress.

Some of the themes may appear to be closely related to topics for the Topic Study Groups, but there the focus is on the presentation and sharing of recent trends in research, development, and practice, whereas here the focus is on the examination and discussion of issues which can be dealt with in different ways depending on different experiences, values, norms, and judgements.

DG 1: Movements, processes, and policy in curriculum reform

This discussion group is supposed to consider issues such as: What are the forces that drive or inhibit curriculum reform, and what are the instruments for reform? How do we know whether reform is progress? How do the various agents responsible for mathematics education policy interact?

DG 2: The relationship between research and practice in mathematics education

This discussion group is supposed to consider issues such as: Can we or should we expect results that can be generalised from mathematics education research? And how can such results lead to changes in practice? What can researchers learn from practitioners in mathematics education? What can practitioners learn from researchers? Where and how should the interaction between practitioners and researchers take place and be organised? What are the ultimate goals of mathematics education research? What are the forces that govern the evolution of mathematics education research? What are the forces that prevent mathematics teachers from benefiting adequately from research?

DG 3: Mathematics education for whom and why? The balance between 'mathematics education for all' and 'for high level mathematical activity'.

This discussion group is supposed to consider issues such as: Who should receive what kinds of mathematics education, why, and with what goals? Is the dichotomy in the title a genuine one? How can 'mathematics education for all' embrace opportunities for high mathematical achievement? How can instructional practices support the development of highly motivated mathematics learners as well as mathematics education for all? Is there sometimes a tendency to tacitly say 'what not everyone can learn, nobody should learn'? What is the future of mathematics as an education subject in a changing world dominated by technology? Is more better, or...? What is mathematical literacy?

DG 4: Philosophy of mathematics education

This discussion group is supposed to consider issues such as: What is the significance of philosophy of mathematics education? To what extent are the authorities of mathematics education implicitly or explicitly influenced by 'recognisable' philosophies of mathematics education? What are the relations between philosophy of mathematics education and other kinds of philosophies, such as educational philosophy, philosophy of mathematics, social philosophy, etc.? In what ways do different philosophies of mathematics education influence its theory and practice?

DG 5: International co-operation in mathematics education

This discussion group is supposed to consider issues such as: What are the goals of international co-operation? Should co-operation be global or regional? What forms could such co-operation take, and how could it be organised and implemented? What are the barriers to international

co-operation? Is there a danger that international co-operation may lead to excessive homogenisation of mathematics education?

DG 6: The education of mathematics teachers

This discussion group is supposed to consider issues such as: What would be an appropriate balance between the main components of teacher education – e.g. mathematical, educational, and pedagogical components – for different educational levels? In particular, what mathematical competencies should different kinds of teachers have? What are the advantages and disadvantages of teachers being educated predominantly as generalists with some mathematical background, or primarily in mathematics with separate educational and pedagogical components being added, or in an integrated manner? How should research on the teaching and learning of mathematics be dealt with in teacher education?

DG 7: Public understanding of mathematics and mathematics education

This discussion group is supposed to consider issues such as: What are the problems associated with the prevalent public understanding of the nature, significance, and role of mathematics in culture and society? Does the general public have adequate perceptions of the nature of mathematical literacy, knowledge and competence, and of what it means and takes to learn mathematics? What can we, in the mathematics education community, do to effectively counteract these problems? To what extent are attempts to popularise mathematics helpful in these respects? Can they be counter-productive?

DG 8: Quality and relevance in mathematics education research

This discussion group is supposed to consider issues such as: What are appropriate criteria for quality and relevance, respectively, in mathematics education research? In actual practice, where and by whom are such criteria established? Are there potential conflicts between the pursuit of quality and the pursuit of relevance in such research? How can criteria be established that pay due respect to the diversity of approaches to mathematics education research?

DG 9: Formation of researchers in mathematics education

This discussion group is supposed to consider issues such as: What academic and professional backgrounds should individuals admitted to graduate studies aiming at mathematics education research have? What is an appropriate balance between course work and work for and on the dissertation? To what extent should research students obtain experiences from institutions abroad? Is international harmonisation of the formation of researchers in mathematics education a desirable goal?

DG 10: Different perspectives, positions, and approaches in mathematics education research

This discussion group is supposed to consider issues such as: To what extent are the different perspectives, positions, and approaches that exist in mathematics education research mutually antagonistic? How can such different ‘schools of thought’ learn from one another? Are there fashion-waves in mathematics education research, and, if so, what are the implications?

DG 11: International comparisons in mathematics education

This discussion group is supposed to consider issues such as: Do international comparisons of performance and achievement tend to produce excessive uniformity across countries with respect to curricula, teaching materials, approaches to teaching and learning, and assessment modes? How do international comparisons influence, for better or for worse, national traditions, values, cultures, and approaches to mathematics education? How can international comparisons foster and further national development in mathematics education?

DG 12: Assessment and testing shaping education, for better and for worse

This discussion group is supposed to consider issues such as: Are current assessment and testing modes and instruments compatible with today’s goals and aims of mathematics education? How do these modes and instruments influence the teaching and learning of mathematics? How much is too much in assessment and testing? Do the costs of testing match the positive results? What is the balance of positive and negative outcomes of testing? How can assessment and testing be devised and

organised so as to serve as means to develop and strengthen the teaching and learning of mathematics? What are the barriers to the adoption of innovative modes of assessment and testing?

DG 13: Evaluation of teachers, curricula, and systems

This discussion group is supposed to consider issues such as: How do current requirements for increased accountability in education, and the ensuing trends of widespread evaluation of teachers, curricula, and systems, influence the teaching and learning of mathematics, as well as teachers and learners? What forms of such evaluation can further and accelerate the development of the mathematics education rather than distort it?

DG 14: Mathematics textbooks

This discussion group is supposed to consider issues such as: To what extents do mathematics textbooks shape the actual teaching and learning of mathematics, for better or worse? What is the balance between textbook impact and that of other forces, e.g. curricula and assessment, which influence mathematics teaching? What are the interests and forces that drive the publication and adoption of textbooks in different countries? Who are the authors of mathematics textbooks in different countries, and what are their backgrounds?

DG 15: Differentiating mathematics classes?

This discussion group is supposed to consider issues such as: What are the educational advantages and disadvantages of homogeneous, respectively heterogeneous classes, with respect to different criteria, such as mixed ability, academic or vocational orientation, single/separate sex, age, etc., and what are the associated challenges for institutions, teachers and students? How can teachers orchestrate intra-class differentiation? What are the likely consequences of the various approaches?

DG 16: The role of mathematical competitions in mathematics education

This discussion group is supposed to consider issues such as: Do mathematical competitions contribute to widening the gap between ‘mathematics for all’ and ‘mathematics for the élite’, or can the opposite be the case? How can competitions motivate and foster mathematical creativity with students at large? To what extent do problems typically set in mathematical competitions adequately reflect the variety and richness of mathematical activity in problem solving? What should the relations be between competitions and mathematics education?

DG 17: Current problems and challenges in pre-school mathematics education

This discussion group is supposed to consider issues such as: To what extent is it desirable to expose pre-school children to structured or institutionalised mathematics teaching? What are the most important current problems, issues, and challenges pertaining to the mathematical education of pre-school children?

DG 18: Current problems and challenges in primary mathematics education

This discussion group is supposed to consider issues such as: What are the most important current problems and challenges pertaining to the teaching and learning of mathematics at the primary level, and where are they located? Are there issues or dilemmas of a controversial nature? How should these problems, issues, and challenges be dealt with?

DG 19: Current problems and challenges in lower secondary mathematics education

This discussion group is supposed to consider issues such as: What are the most important current problems and challenges pertaining to the teaching and learning of mathematics at the lower secondary level, and where are they located? Are there issues or dilemmas of a controversial nature? How should these problems, issues, and challenges be dealt with?

DG 20: Current problems and challenges in upper secondary mathematics education

This discussion group is supposed to consider issues such as: What are the most important current problems and challenges pertaining to the teaching and learning of mathematics at the upper secondary level, and where are they located? Are there issues or dilemmas of a controversial nature? How should these problems, issues, and challenges be dealt with?

DG 21: Current problems and challenges in non-university tertiary mathematics education

This discussion group is supposed to consider issues such as: What are the most important current problems and challenges pertaining to the teaching and learning of mathematics at the non-university tertiary level, and where are they located? Are there issues or dilemmas of a controversial nature? How should these problems, issues and challenges be dealt with?

DG 22: Current problems and challenges in university mathematics education

This discussion group is supposed to consider issues such as: What are the most important current problems and challenges pertaining to the teaching and learning of mathematics at the university level, and where are they located? Are there issues or dilemmas of a controversial nature? How should these problems, issues, and challenges be dealt with?

DG 23: Current problems and challenges concerning students with special needs

This discussion group is supposed to consider issues such as: What are the most important current problems and challenges pertaining to the teaching and learning of mathematics for students with special needs, and where are they located? Are there issues or dilemmas of a controversial nature? How should these problems, issues, and challenges be dealt with?

DG 24: Current problems and challenges in distance teaching and learning

This discussion group is supposed to consider issues such as: What are the most important current problems and challenges pertaining to distance teaching and learning of mathematics, and where are they located? Are there issues or dilemmas of a controversial nature? How should these problems, issues, and challenges be dealt with?

Thematic Afternoon

During one afternoon, the scientific programme will be organised into a limited number of overarching themes of general interest to mathematics educators. The themes, which will run in parallel, will take the shape of mini-conferences, comprising both sub-themes that focus on research and development, and sub-themes that focus on issues and problems. The sub-themes will be scheduled in parallel, but structured in such a way that participants may, if they so want, change between the sub-themes at various times. Organising teams will be appointed for each theme.

The themes are:

A. Teachers of mathematics: Recruitment and retention, professional development and identity

- Recruitment, supply, and retention of mathematics teachers
- Pre- and in-service education of mathematics teachers
- Mathematics teachers' identity – their views on, and how they position themselves in relation to, mathematics, teaching, and learning
- The mathematical competencies of teachers

B. Mathematics education in society and culture

- Multilingual and multicultural classrooms: Increasing diversity
- Mathematics education within and across different cultures and traditions
- Social and political contexts for mathematics education
- Equity in mathematics education: Culture, gender, and social class

C. Mathematics and mathematics education

- Trends in the mathematical sciences, and their influence on mathematics education
- The role of research mathematicians in mathematics education
- New and old mathematical topics, and the balances between them, in mathematics curricula
- The mathematics educator: Mathematician or pedagogue?

D. Technology in mathematics education

- New developments in information and communication technology for mathematics education
- Advantages and pitfalls concerning technology in mathematics education
- The internet and mathematics education: Accessibility, use and misuse
- Technology in distance teaching and learning

E. Perspectives on research in mathematics education from other disciplines

- The perspective of psychology and cognitive science in research in mathematics education
- The perspective of philosophy in research in mathematics education
- The perspective of anthropology and sociology in research in mathematics education
- The perspective of general education in research in mathematics education

Workshops and Sharing Experiences Groups

A *Workshop* is a hands-on activity aimed at a limited number of teachers (from pre-school to university), graduate students, or other interested parties. It deals with something to be learnt or tried through active participation in hands-on work during 2-3 slots of 1-1½ hours. For example, topics such as a new methodology or technique in mathematics education research; a new approach to teaching; a new mathematical topic; a new piece of information and communication technology; methods to analyse videotapes from classroom sessions; and ways to read or write academic papers in mathematics education, will be explored through the Workshops.

Similarly, a *Sharing Experiences Group*, too, is a small interactive group gathering to exchange and discuss experiences concerning a well-defined theme of common interest. SEGs will cover topics such as the initiation of a research project; the balance between course work and dissertation work in a PhD study; problems encountered in planning and carrying through empirical research; obstacles to innovation experienced by individual teachers who want to adopt innovative approaches to teaching or assessment; team teaching; problems encountered in graduate supervision, etc.

A Workshop or an SEG may be established on the initiative of individuals or groups of people who submit a proposal to the IPC without having been invited to do so. However, only clearly non-commercial groups will be accepted in the scientific programme. A proposal for a Workshop or an SEG should include a clear and brief description of the suggested goal, scope, format, and audience, and be accompanied by considerations regarding the expected relevance and viability of the Group. Each Workshop or SEG will have a leader invited by the IPC. Workshops and SEGs will be scheduled in parallel with Topic Study Groups and Discussion Groups.

Posters and Round Tables

Congress participants are invited to submit proposals of posters for display in the poster area. Time slots will be made available for presentation of the posters. The IPC is considering the possibility of grouping posters according to themes and to schedule particular Round Table sessions for commentary and discussion of a limited number of posters belonging to the same theme.

National Presentations

A National Presentation is an activity during which representatives of a given country will make a presentation on the state and trends in mathematics education in that country. An exhibition, video shows, cd-roms and so forth may accompany these National Presentations

There will be a combination of regional and national presentations of mathematics education in the *Nordic countries*, Denmark, Finland, Iceland, Norway, and Sweden.

There will also be National Presentations by *Rumania* and *Russia*, and two more countries are yet to be confirmed.

Submissions and proposals

Presentation of papers will take place only within one of the established programme components described above. Organisers will be appointed in charge of the different items in the programme and all submissions of papers or proposals should be addressed directly to the relevant organiser. Until then, submissions or proposals may be sent to the Chair of the International Programme Committee.

For several reasons, it will not be possible to have all papers that have been accepted by the organisers on the basis of quality and relevance, presented orally at ICME-10. For such papers, the Presentation by Distribution scheme, which was invented for ICME-9, will also be adopted for ICME-10. This is to ensure that all papers will be made available to all participants in the relevant groups.