

3rd Announcement

<http://icme12.org>

ICME-12

The 12th International Congress on Mathematical Education

July 8th to 15th, 2012
COEX, Seoul, Korea

Cheomseongdae, a bottle-shaped building, was built in 647 and was used as an astronomical observatory. The tower is built out of 362 pieces of cut granite which some claim represent the 362 days of the lunar year. 12 layers are below the window level, and 12 layers are above. These set of stones may symbolize the 12 months of the year. The combined shape of square and circle which symbolize the ground and sky respectively shows the beauty of harmony. It is located in Gyeongju which was the capital of the Silla Kingdom for a thousand years.



International Commission on
Mathematical Instruction



WELCOME TO ICME -12



IPC Chair
Sung Je Cho

On behalf of the organizing bodies for the **12th International Congress on Mathematical Education(ICME-12)**, the International Programme Committee(IPC), the Local Organizing Committee(LOC), and National Advisory Committee(NAC), I cordially invite all the readers of this Third Announcement to participate in the ICME-12 to be held in Seoul from July 8th to 15th, 2012. The Congress is to be held under the auspices of the International Commission on Mathematical Instruction(ICMI).

The IPC, comprised of 22 members from 18 countries, has 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 pioneers of mathematics education all over the world. The programme will provide food for thought and inspiration for practice for all, from established mathematics educators of world renown to novices in the field attending their first ICME, and everyone else with interest in mathematics education. Through Plenary Activities, Regular Lectures, Survey Teams, Topic Study Groups, Discussion Groups, and other activities, the state of the art in mathematics education research and the practice of mathematics teaching and learning will be examined and demonstrated from international perspectives.

The LOC is comprised of four subcommittees for planning, financing, administrating and advertising the event, as well as monitoring various emerging issues. All these sub-committees have made every effort to make ICME-12 successful in contributing to the sustainable development of mathematics education not only across the whole world but also within Korea. Since the Second Announcement issued in the last April, LOC has achieved many things such as: developing the implementing database system for proposal and paper submissions and registration, funding the budget, embodying the Congress scientific programme planned by IPC, developing various cultural events including excursions and exhibitions, and securing accommodations with reasonable prices, etc.

This Third Announcement is the summary of what these committees have done so far, containing helpful information for all who are planning to participate in ICME-12. I would like to express my sincere thanks to all IPC members and LOC members for their commitment and thoughtfulness. Particularly, I am thankful to all Congress Subcommittee members for their efforts in making the preparation of this announcement possible.

I am very much looking forward to seeing you at ICME-12 in Seoul and am sure that your participation will contribute to the success of the ICME-12.

TABLE OF CONTENTS



12th International Congress on Mathematical Education

Welcome Message	2
Contents, Homepage, Addresses	4
What is ICME?	5
Organizing Committees	7
The Scientific Program	9
Plenary Activities	9
Survey Teams	10
National Presentations	11
Regular Lectures	14
Topic Study Groups	16
Discussion Groups	60
Workshops & Sharing Groups	77
Posters	78
Affiliate Organizations (AO)	79
ICMI Studies and Klein Project	79
Mathematical Carnival	80
Official Meetings	80
Grants for Participants	81
ICMI Awards	81
ICME-12 Poster	82
Timetable for ICME-12	83
Accommodation	84
Excursions	87
Registration	88
General Information	89
Public Supporting Bodies	90

<http://icme12.org>

Be sure to visit the official ICME-12 website.

Participants will find useful information about every aspect of the Congress in this site. The web page is being constantly updated in order to keep participants and interested people informed.

Congress Period and Venue

The Congress is to be held on **July 8th to 15th in 2012**. All of the Congress activities will take place at the COEX (Convention & Exhibition Center) in Seoul, Korea. COEX, World Trade Center, 159 Samsung-dong, Gangnam-gu, Seoul 135-731, Korea

Important Addresses

International Programme Committee, Chair

Emeritus Professor Sung Je Cho

Seoul National University

sungjcho@snu.ac.kr

Local Organizing Committee, Chair

Professor Hyun Yong Shin

Korea National University of Education

shin@knue.ac.kr

Congress Sub-committee of LOC, Chair

Professor Hee-chan Lew

Korea National University of Education

hclew@knue.ac.kr

Professional Conference Organizer

Dr. Claire (So Young) Lee

MCI Korea, myclaire0331@gmail.com

82-2-576-9945(Tel), 82-2-579-2662(Fax)

Important Deadlines

Submission of Proposals

Topic Study Group(TSG) November 30, 2011

Workshops & Sharing Group(WSG) November 30, 2011

Posters December 15, 2011

Notification of Acceptance

WSG Acceptance December 31, 2011

TSG and Posters January 15, 2012

ICME-12 Grants

Application February 15, 2012

Notification to Grantees March 1, 2012

Submission of Final Paper and Description of Programme Items

April 10, 2012

Registration Fee

Category	Before April 1, 2012	Before June 1, 2012	From June 2, 2012
General	USD400	USD450	USD500
HPM or MCG Participant	USD320	USD360	USD400
Accompanying Person		USD130	



WHAT IS ICME?

The International Congress on Mathematical Education (ICME) is held every four years under the auspices of the International Commission on Mathematical Instruction (ICMI). It is, however, planned and organized by separate committees which operate independently of the ICMI: the International Program Committee (IPC) and the Local Organizing Committee (LOC).

The aim of the Congress is to present the current state of and trends in mathematics education research and in the practice of mathematics teaching at all levels. The Congress will gather a broad spectrum of participants such as researchers in mathematics education, teacher trainers, practicing teachers, mathematicians and others interested in mathematics education.

The ICME Philosophy

An International Congress on Mathematics Education (ICME) serves two major functions. On the one hand it provides a scholarly opportunity for discussion, debate, and the presentation of new research and theory in all aspects of mathematics education. On the other hand it is a meeting place for the international community of mathematics education: mathematicians, teachers, policy-makers, resource producers and distributors, as well as mathematics educators and researchers. We seek to simultaneously engage in serious scholarship and inclusive participation.

The scholarly aspect of ICME is represented by the Plenary Lectures, Survey Teams, Regular Lectures and Topic Study Groups, and other forums. The people involved are chosen because of their high levels of scholarship, but also with care for representativeness. The Topic Study Group Co-Chairs and Team members also represent leaders in their field with due consideration for representativeness. All presentations in the Congress are potentially subject to review, and may be allocated a time or mode of presentation that reflects its quality.

Inclusiveness within ICME is obtained in many forms. All who wish to attend are welcomed, and all who wish to present will be given some opportunities to do so in an appropriate Topic Study Group. This may be an oral, or a poster presentation. ICME organizers also make special efforts to assist those who have financial or other difficulties for attending. New and inexperienced members of the ICME community are especially welcomed.

It has long been recognized by ICME organizers that collaboration is the best way of advancing our understanding of any topic. Thus there is a need to give individual voices the opportunity to be heard and the community the opportunity of hearing them.

Another factor in inclusiveness is the issue of language. While English is the official language of the congress, ICME organizers are making every effort to accommodate the fact that many participants will not have English as their first language, recognizing that there will be significant groups of participants from other language regions. In particular, the local languages of the Congress host country needs special attention.



The International Commission on Mathematical Instruction (ICMI) was first established at the International Congress of Mathematicians held in Rome, in 1908, with Felix Klein as its first president, and in 1952 as an official commission of International Mathematical Union (IMU). As a commission, ICMI is defined by two constituent components: the Executive Committee (EC) of ICMI, elected by the General Assembly of ICMI for a four-year term, and the ICMI Representatives of the member states.

The members of ICMI are neither individuals nor organizations, agencies, etc., but countries. Member states are of two categories: all countries members of IMU are automatically members of ICMI and, in addition, ICMI may, with the approval of the Executive Committee of IMU, co-opt on an individual basis, as so-called non-IMU members, countries which for some reason or another are unable to join the IMU. There are currently 90 member states of ICMI. Each member state, whether an IMU country or not, is entitled to appoint a National Representative.

From the very beginning, the international journal *L'Enseignement Mathématique*, founded in 1899 by Henri Fehr and Charles Laisant, was adopted as the official organ of ICMI - which it is still today. ICMI also publishes, under the editorship of the Secretary General, a Bulletin as well as an electronic newsletter, ICMI News, appearing bi-monthly. For the information about ICMI is available on its website, www.mathunion.org/icmi.

As a scientific union, IMU is a member organization of the International Council for Science (ICSU). This implies that ICMI, through IMU, is to abide by the ICSU statutes, one of which establishes the principle of non-discrimination. This principle affirms the right and freedom of scientists to associate in international scientific activities regardless of citizenship, religion, political stance, ethnic origin, sex, and suchlike. Apart from observing general IMU and ICSU rules and principles, ICMI works with a large degree of autonomy.

ICMI Executive Committee

President

William (Bill) Barton, University of Auckland, b.barton@auckland.ac.nz

Vice Presidents

Mina Teicher, Bar-Ilan University, teicher@macs.biu.ac.il

Angel Ruiz, Universidad de Costa Rica, angelruizz@racsa.co.cr

Secretary-General

Jaime Carvalho e Silva, Universidade de Coimbra, jaimecs@mat.uc.pt

Members-at-Large

Mariolina Bartolini Bussi, Università degli studi di Modena e Reggio Emilia, mariagiuseppina.bartolini@unimore.it

Sung Je Cho, Seoul National University, sungjcho@snu.ac.kr

Roger Howe, Yale University Dunham Laboratory, howe@math.yale.edu

Renuka Vithal, University of KwaZulu-Natal, vithalr@ukzn.ac.za

Zhang Yingbo, Beijing Normal University, zhangyb@bnu.edu.cn

Ex-officio Members

Michèle Artigue, Past President of ICMI, Université Paris Diderot-Paris 7, michele.artigue@univ-paris-diderot.fr

Ingrid Daubechies, President of IMU, Princeton University, vmarino@princeton.edu

Martin Groetschel, Secretary of IMU, Konrad-Zuse-Zentrum für Informationstechnik Berlin (ZIB), groetschel@zib.de

Past ICMEs

1	1969	Lyon	France
2	1972	Exeter	England
3	1976	Karlsruhe	Germany
4	1980	Berkeley	USA
5	1984	Adelaide	Australia
6	1988	Budapest	Hungary
7	1992	Quebec	Canada
8	1996	Seville	Spain
9	2000	Tokyo	Japan
10	2004	Copenhagen	Denmark
11	2008	Monterrey	Mexico

ORGANIZING COMMITTEE



International Programme Committee

Michèle ARTIGUE, Université Paris Diderot - Paris 7, *michele.artigue@univ-paris-diderot.fr*
 Évelyne BARBIN, Centre François Viète, Université de Nantes, *evelyne.barbin@univ-nantes.fr*
 Bill BARTON, Ex officio, President of ICMI, The University of Auckland, *b.barton@auckland.ac.nz*
 Morten BLOMHOEJ, IMFUFA Roskilde University, *morten@ruc.dk*
 Gail BURRILL, Michigan State University, *burrill@msu.edu*
 Jaime CARVALHO E SILVA, Ex officio, Secretary-General of ICMI, Universidade de Coimbra, *jaimecs@mat.uc.pt*
 Sung Je CHO, Chair, Seoul National University, *sungjcho@snu.ac.kr*
 Johann ENGELBRECHT, University of Pretoria, *johann.engelbrecht@up.ac.za*
 Bernard R. HODGSON, Université Laval, *bhodgson@mat.ulaval.ca*
 Gabriele KAISER, University of Hamburg, *gabriele.kaiser@uni-hamburg.de*
 Mercy KAZIMA, University of Malawi, *mkazima@chanco.unima.mw*
 Petar KENDEROV, Higher Attestation Commission, *kenderovp@cc.bas.bg*
 Masataka KOYAMA, Hiroshima University, *mkoyama@hiroshima-u.ac.jp*
 Oh Nam KWON, Seoul National University, *onkwon@snu.ac.kr*
 Frederick LEUNG, The University of Hong Kong, *hraslks@hku.hk*
 Hee Chan LEW, Korea National University of Education, *hclew@knue.ac.kr*
 Shiqi LI, East China Normal University, *sqli@math.ecnu.edu.cn*
 Cheryl PRAEGER, University of Western Australia, *cheryl.praeger@uwa.edu.au*
 Marcela SANTILLÁN, Directora General de Educación para Profesionales de la Educación, *m.santillan@upn.mx*
 Hyun Yong SHIN, Chair of the LOC, Korea National University of Education, *shin@knue.ac.kr*
 K.(Ravi) SUBRAMANIAM, Tata Institute of Fundamental Research, *subra@hbcse.tifr.res.in*
 Yuriko YAMAMOTO BALDIN, Universidade Federal de São Carlos, *yuriko@dm.ufscar.br*

Local Organizing Committee

Hoon CHANG, Inha University
 Kyung Yoon CHANG, Konkuk University
 Sooil CHOI, Kyung Bok High School
 Boo Yoon KIM, Pusan National University
 Sung Sook KIM, Paichai University
 Dongheun LEE, Hana Academy Seoul
 June Bok LEE, Yonsei University
 Joong Kwoen LEE, Dongguk University
 Jung Rae LEE, Chair of the Financial Sub-committee, Daejin University
 Kyeong Hwa LEE, Seoul National University
 Sang Gu LEE, Sungkyunkwan University
 Hee Chan LEW, Vice Chair, Chair of the Congress Sub-committee, Korea National University of Education
 Kyung Mee PARK, Chair of the Public Information Sub-committee, Hongik University
 Man Goo PARK, Seoul National University of Education
 Sun Hwa PARK, Korea Institute for Curriculum and Evaluation
 Seog Hoon RIM, Kyungpook National University
 Tae Weon SEOK, Sem & Tech Co., Ltd.
 Joon Kook SHIN, Chair of the Planning Sub-committee, Chungnam National University
 Dong Yun SHIN, University of Seoul
 Hyun Yong SHIN, Chair, Korea National University of Education
 Lee Sup SHIN, Korea Foundation For the Advancement of Science and Creativity
 Yeong-Moo SONG, Sunchon National University
 Woo Hyung WHANG, Korea University

Expert Advisory Committee

EunMi CHOI, Hannam University
Gooyeon KIM, Sogang University
Rae Young KIM, Ewha Womans University
Ho Kyoung KO, Ajou University
Nayoung KWON, Inha University
Jae Hong SHIN, Korea National University of Education
Dong Joong KIM, Korea National University of Education

Congress Secretariat

Dong Geoun HUR, Director
Jun Young NA, Section Chief

Math Teachers' Professional Development Committee

Wan KANG, Chair, Seoul National University of Education
Hong Shick JANG, Vice-chair, Hanyoung Foreign Language High School
Byeong Chan SHIN, Vice-chair, Changduck Girls' High School
Kyung Ho JEONG, Gwangju University of Education cational Research Service
Sooll CHOI, Kyungbock High School
Jung LEE, Daegwang Elementary School
Seong Yee CHOI, Jungdae Elementary School
Won Kyoo PARK, Sumyeong Elementary School
Shin Young KIM, Seongsoo Elementary School
Suck Yoon PAIK, Seoul National University of Education
In Sun SHIN, Korea National University of Education
Sae Ran KWON, Daelim University College
Kyeong Hwa LEE, Seoul National University
Man Goo PARK, Seoul National University of Education
Young Hoon PARK, Naon Education Research Institute
Hong Min YANG, Hanyoung Foreign Language High School
So Young KANG, Sungseo Middle School
Jong Sik JUNG, Attached Middle School of Chungang University
Myong-Hi Nina Kim, SUNY College at Old Westbury

Cultural Event Committee

Hyun Yong SHIN, Korea National University of Education
Hoon CHANG, Chair, MathLove/Inha University
Bo Euk SUH, Vice-chair, Catholic University of Daegu
Kyung Eon LEE, Jeju National University
Min Ji YUN, Sunghnam Girls High School
Myung Sook CHOI, Suri High School
Tae Seon MUN, Kangbuk Middle School
Byung Joo PARK, Yeongdong High School
Hyun Cheol KIM, Vice-chair, Gyeongdeok Middle School
Mun Su KIM, Ulsan Computer Science High School
Dae Won SON, Jinju Foreign Language High School
Young Gwan KIM, Jungmun Middle School
Young Hwa KIM, Yeomyeong Middle School
Moon Tae IM, Seosan Girls High School

Interdisciplinary Studies Committee

Seung Urn CHOE, Chair, Seoul National University

Tae Wuk LEE, Korea National University of Education
June Hee YOO, Seoul National University
Chang Kyun PARK, Seokyeong University
Young Hee KYE, Kosin University
Woo Sik HYUN, Hoseo University
Hyouk KIM, Gyeonggi Science High School
Sun Bok BAE, Hongik University
Hyang Sook KIM, Inje University
Tae Yon KIM, Novelist

National Advisory Committee

Jong Hae GEUM, Professor of Korea Institute for Advanced Study
Sun Wook HWANG, Professor of Soongsil University
Sun Young JANG, President of Korean Women in Mathematical Sciences
Joo Hee JUNG, President of Korean Association for Mathematical Logic
Ok Ki KANG, Professor of Sungkyunkwan University
Do Han KIM, President of KSICMI, Seoul National University
Kun Soo KIM, Vice President of Korea Tourism Organization
Myung Hwan KIM, Professor of Seoul National University
Wan Soon KIM, Professor of Hoseo University
Kye Won KOH, Professor of Ajou University
Jae Sool KWON, President of Korea National University of Education
Don Hee LEE, Chair, Former Minister of Education, Science, and Technology
Hei Sook LEE, Professor of Ewha University
Hee Chan LEW, President of Korea Society of Mathematical Studies in Mathematics
Kyung Chan MIN, Professor of Yonsei University
Chang Kyun PARK, President of the Korean Society for History of Mathematics
Jung Chan PARK, President of Yonhap News Agency
Kyu Hong PARK, President of Korean Society of Mathematical Education
Jung Woong RA, President of Korean Society for Industrial and Applied Mathematics

THE SCIENTIFIC PROGRAM



The scientific program for ICME-12 is the result of the evolution, not only of the ICME congresses but of mathematics education itself. The complexity of the program structure of ICME-12 responds to various characteristics and needs of the international community of mathematics education professionals, including a variety of topics and types of activities. Below you will find our attempt to explain the rationale that gave shape and structure to the Scientific Program for ICME-12.

In the pages that follow, you will find a section on each scientific program component, stressing the fact that the program is built upon the work of the community. In it we describe how groups or individuals can share their work and thoughts with their peers in the various activities open to participation.

The different components of the program are then described, including the names of chairs and members of organizing teams for group activities, moderators and panelists for panel debates, and lecturers. Readers are invited to consult our web site for further details. The web site will be regularly updated. Questions and proposals concerning matters pertaining to the program should be addressed to the Chair of IPC.

Plenary Activities

The plenary activities are those components of the scientific program that address all congress participants at the same

time. For ICME-12 there will be eight different plenary activities. After the lectures, there will be an opportunity for participants to meet and discuss with the lecturers. Names and Countries/Regions of persons determined up to now as involved in the plenary activities are as follows:

- PL1 (Lecture): Don Hee Lee(Korea), Mathematics Education in the National Curriculum System
 PL2 (Lecture): Etienne Ghys(France), TBA
 PL3 (Lecture): Bernard R. Hodgson(Canada), Whither the Mathematics / Didactics Interconnection? Evolution and Challenges of a Kaleidoscopic Relationship as seen from an ICMI Perspective.
 PL4 (Lecture): Mamokgethi Setati(South Africa), Mathematics Education and Language Diversity: Background, Findings and Future Research Directions
 PL5 (Panel): Konrad Krainer(Chair, Austria), Feng-Jui Hsieh(Taiwan), Ray Peck(Australia), Maria Teresa Tatto(USA), Teacher Education and Development Study - Learning to Teach Mathematics (TEDS-M)
 PL6 (Panel): Frederick Leung(Chair, Hong Kong), Binyan Xu(China), Kyungmee Park(Korea), Yoshinori Shimizu(Japan), Math Education in East Asia(Korea – China – Japan)
 PL7 (Lecture): Jo Boaler(USA), TBA
 PL8 (Lecture): Werner Blum(Germany), Quality Teaching of Mathematical Modelling – What Do We Know, What Can We Do?

Survey Teams

Continuing the practice of recent ICMEs, five ICME-12 Survey Teams (ST) have been appointed. Each team will work until the congress to survey the state of the art with respect to a certain theme or issue, with particular regard to identifying and characterizing important new knowledge, recent developments, new perspectives, and emergent issues. The creation of these teams is intended to strengthen the emphasis on new developments and progress in the area of each theme or issue since the latest ICMEs. The themes and names and countries/regions of persons involved in the Survey Teams are as follows:

ST1: The Relationship Between Research and Curriculum Design

Chair: Glenda Lappan(USA) glappan@math.msu.edu

Team Members: Jianseng Bao(China) jsba0325@yahoo.co.uk
 Malcolm Swan(UK) malcolm.swan@nottingham.ac.uk
 Vinicio de Macedo Santos(Brazil) vms@usp.br
 Keiko Hino(Japan) khino@cc.utsunomiya-u.ac.jp
 Karen D'Emilio(Namibia) kats@iway.na

Liaison IPC member: Gail Burrill burrill@msu.edu

ST2 : Gender and Mathematics Education (revisited)

Chair: Gilah Leder(Australia) Gilah.Leder@monash.edu

Team Members: Helen Forgasz(Australia) Helen.Forgasz@monash.edu
 Lovisa Sumpter(Sweden) lovisa.sumpter@edu.uu.se
 Jayasree Subramanian(India) j_manian@yahoo.com
 Nouzha El Yacoubi(Morocco) n.elyacoubi@yahoo.fr
 Sarah Theule Lubienski(USA) stl@illinois.edu
 Maria Trigueros(Mexico) trigue@itam.mx

Liaison IPC member: Gabriele Kaiser gabriele.kaiser@uni-hamburg.de

ST3 : The History of Mathematics for Supporting an Interdisciplinary Approach to Mathematics Education

Chair: Costas Tzanakis(Greece) tzanakis@edc.uoc.gr

Team Members: Hans Niels Jahnke(Germany) njahnke@uni-due.de
 Tinne Hoff Kjeldsen(Denmark) thk@ruc.dk
 Tatina Roque(Brazil) tati@im.ufrj.br
 Man Keung Siu(Hong Kong) mathsiu@hkucc.hku.hk
 Jan van Maanen(The Netherlands) maanen@math.rug.nl

Liaison IPC member: Evelyne Barbin evelyne.barbin@wanadoo.fr

ST4 : Key Mathematical Concepts in the Transition from Secondary to University

Chair: Mike Thomas(New Zealand) *moj.thomas@auckland.ac.nz*

Team Members: Elena Nardi(UK) *e.nardi@uea.ac.uk*

Danielle Huillet(Mozambique) *danielle.huillet@yahoo.fr*

Chris Rasmussen(USA) *chrisraz@sciences.sdsu.edu*

Iole de Freitas Druck(Brazil) *iole@ime.usp.br*

Mi kyung Ju(Korea) *mkju11@hanyang.ac.kr*

Jinxing Xie(China) *jxie@math.tsinghua.edu.cn*

Liaison IPC member: Johann Engelbrecht *johann.engelbrecht@up.ac.za*

ST5 : Socio-economic Influence on Students' Achievement

Chair: Paola Valero(Denmark) *paola@learning.aau.dk*

Team Members: Danny Martin(USA) *dbmartin@uic.edu*

Murad Jurdak(Lebanon) *jurdak@aub.edu.lb*

Tamsin Meaney(Australia) *tmeaney@csu.edu.au*

Mellony Graven(South Africa) *mellony.graven@wits.ac.za*

Miriam Penteado(Brazil) *mirgps@rc.unesp.br*

Liaison IPC member: Morten Blomhøj *morten@ruc.dk*

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. ICME-12 will have a combination of four National Presentations and one Regional Presentation of mathematics education. Names of Organizers are as follows:

NP1 Korea

Organizer: Sun-Hwa Park *shpark@kice.re.kr*

1. National Mathematics Curriculum

Korea has adopted the 2007 Revised National Mathematics Curriculum in primary and secondary education. It will be applied to elementary and middle schools in 2013 and to high schools in 2014.

2. Textbook Developments and Evaluation

In Korea, all elementary schools use the same textbooks developed by the government. From 2013, textbooks for middle and high schools will be approved by city and provincial education offices. The textbook evaluation system and the main features of the mathematics textbooks will be discussed.

3. Teaching and Learning Mathematics

We will present teaching and learning practices in mathematics classes as well as relevant teaching materials that are used by teachers in elementary, middle, and high schools. In addition, this section will introduce samples of best practices and useful materials.

4. Assessment

We will discuss the national assessment of educational achievement in Korea and the Korean College Scholastic Achievement Test will also be examined. First, changes in the national assessment of educational achievement and the characteristics of Korean students' mathematical abilities will be presented. Second, trends in mathematical education as analysed in international comparative studies such as PISA and TIMSS will be discussed. Third, the role of the College Scholastic Ability Test (CSAT) for college admission in Korea will be introduced.

5. Teacher Education

Because of the increasing demands for enhanced quality in school education, systematic management of pre-service and in-service teachers has become an important issue in Korea. The core capabilities for mathematics teachers will be

defined. Education for pre-service teachers, teacher selection processes, and training programs for in-service teachers will be discussed.

NP2 Singapore

Organizer: Kaur Berinderjeet berinderjeet.kaur@nie.edu.sg

1. Brief introduction of the Education System

An overview of the education system in Singapore and how it has evolved over time to meet the needs of the nation.

2. Designing a Mathematics Curriculum to Meet the Needs of Every Student

Singapore has a national curriculum developed by the Ministry of Education. The central focus of the mathematics curriculum is mathematical problem solving. A single mathematics curriculum framework guides the development of all syllabuses.

3. Instructional Materials Development

Instructional materials such as textbooks are outsourced to commercial publishers. The Ministry evaluates texts and provides supplementary resources.

4. Support for Low Achievers and Programmes for the Gifted

The support for low achievers in Mathematics is carried from Primary 1, where students are identified for 'pull-out' classes. Also, the MOE has set up a specialised independent school to provide a customised curriculum for students who are gifted.

5. National Examinations

There are national examinations at key stage years of Grades 6, 10 and 12. At Grade 6, all students will take a Primary School Leaving Examination. At the secondary and pre-university levels, there are the O, N and A-level examinations.

6. Students' Achievements in International Comparative Studies

Singapore has done well in international comparative studies such as TIMSS and PISA. The presentation will share some of the insights and learning gleaned from these studies and how they informed curriculum review and development.

7. Teacher Preparation and Development and Mathematics Education Research in Singapore

The National Institute of Education (NIE) is the sole teacher education institution in Singapore. We will briefly describe the 6 broad recommendations of their new Model of Teacher Education for the 21st Century (TE21) emphasising two of them: the Values, Skills and Knowledge model and the Teacher Competencies framework.

Trainee teachers take mathematics-related courses called Curriculum Studies (methodology), Subject Knowledge (deeper understanding of school mathematics), and Academic Studies (tertiary mathematics). These courses are taught by the mathematicians, mathematics educators, and those with expertise in both areas. We will describe these courses.

Teachers have different pathways for professional development. We will describe how the Ministry of Education (MOE), National Institute of Education (NIE) and professional organisations for mathematics teachers support practicing mathematics teachers' professional development.

8. Mathematics Education Research in Singapore

We will showcase some research projects that have had a significant impact on the teaching and learning of mathematics in Singapore schools.

NP3 USA

Organizer: Rick Scott pscott@nmsu.edu

The United States will be highlighting what we think makes mathematics education unique in the United States and will present what we believe to be the state of the art of our efforts to provide a quality mathematics education for all students.

1. Overview of Mathematics Education in the U.S.: Curriculum Reform

- Overview of State of Mathematics Ed in US: Reasoning and Sense Making
- Mathematical Practices in the State Common Core Standards
- Research Perspectives on Mathematics Standards Reform in the U.S.

2. Teaching Mathematics in the U.S.

- The Mathematics Studio: Sustainable School-Based Professional Learning
- Mathematical Knowledge for Teaching

The exhibit area will present examples of initiatives related to the Common Core State Standards, technology resources, contributions from numerous professional organisations, contributions of the Presidential Awardees for Mathematics Teaching, and information about US programmes related to mathematics competitions and unique programs for teachers such as the Park City Mathematics Institute and the revised CBMS Mathematical Education of Teachers and efforts related to its dissemination.

In addition to the exhibits, there will be short presentations from some of the mathematical organisations and some by classroom teachers related to their use of technology and for video clips of teachers in their classrooms. Mathematics teachers from all levels who have received special travel grants to attend ICME-12 will prepare posters and take turns to discuss mathematics education in the United States with international participants.

NP4 India

Organizers: Krishan Lal esoffice@insa.nic.in

Brotati Chattopadhyay icsu@insa.nic.in

India is a land characterized by its linguistic and cultural diversity, a democracy grappling with problems of poverty and illiteracy while at the same time confidently looking to address these and emerge as a global economic power. The landscape of Mathematics education in India reflects this reality, offering a kaleidoscope of innovations and initiatives, challenges and endemic problems. India's National Presentation will offer a taste of the richness of mathematics education in India.

The themes of INP will be grouped as:

1. Historical and cultural aspects of mathematics and mathematics education including historical contributions to mathematics, folk and ethnomathematics, mathematics education in pre-colonial India, and the colonial encounter.
2. Systemic and policy aspects of education including an introduction to general structures of education in India, critical issues, selection and board examination systems, assessment culture, the "coaching industry", language policy, gender issues, regional diversity, equity policies and measures adopted by the Central and State Governments.
3. Curriculum and pedagogy at various levels. At the school level, the curricula of the central and state boards of education, and the impact of the National Curriculum Framework 2005 will be discussed. Nurture and enrichment programmes, especially at the secondary and tertiary levels, will be discussed.
4. Teacher education and development including discussions about the large number of schools and colleges, vs the shortfall of trained teachers; issues of content knowledge of teachers; structural challenges in teacher education; emergence of teachers' networks; and the Sarva Shiksha Abhyas initiative.

NP5 Spanish Cultural Heritage

Organizer: Luis Rico lrco@ugr.es

The relevance of mathematics in the relations between Spain and America has remained unbroken since its beginning 500 years ago. Julio Rey Pastor emphasises the importance and scope of this heritage for its scientific and technological use and benefit in the discovery of America. Since then, throughout 500 years of continuous cultural cooperation, the

mathematical background shared by Spain and the American people and countries has remained solid and permanent.

A few points will serve to summarise this shared task:

- Universities: the first universities to be founded in America are those of Santo Domingo (1538), San Marcos University, Lima (1551) and the University of Mexico (1542).
- Resource centers: the development and improvement of cosmography, necessary for travel between both continents, drove the growth of mathematical disciplines and contributed to the foundation of centers and specialised libraries, such as that at El Escorial, from the late XVI century.
- Research: from 1736 to 1744, Spanish scientists (Jorge Juan among them) participated in measuring the arc of meridian in Quito to determine the land value of a degree.
- Scientific dissemination: José Celestino Mutis held the Chair of Mathematics at the College of Rosario in Santa Fe de Bogota in 1762, where he presented the Copernican system principles of modern science and the experimental method, the appropriateness of teaching the Copernican principles, as well as modern physics and mathematics, inspired by Newton.
- Higher education: among the many trips emphasising training, that undertaken by Simon Bolivar in 1799, who studied mathematics at the Academy of San Fernando in Madrid.
- Publications: the work of J. M. Vallejo was widely read and exerted considerable influence in Mexico during the first half of the nineteenth century.
- Teaching and research at the university: among the exiles as a result of the Spanish Civil War (1936-1939) there were a significant number of Spanish mathematicians, such as Rey Pastor and Santaló, who settled in different Spanish-American republics, to form research universities.
- Collaboration between researchers: A recent study for the period 1997-2007, de León and Zuazua show the existence of systematic cooperation between Spanish and Latin American mathematicians.

These are all examples revealing the wealth of mathematical activity conducted in collaboration as members of a joint political and cultural society.

Much more recent is the specific cooperation in mathematics education, which is multicultural and has continued to grow and develop since the proposals for a wide range of centers and institutions.

Regular Lectures

The regular lectures will be given by 78 prominent mathematics educators from different parts of the world who have been invited by the IPC. The lectures will cover a wide spectrum of topics, themes, and issues. The list below contains the names and countries/regions of persons who have accepted the invitation and given the preliminary title of the lecture. The list will be updated and will eventually include final titles, abstracts and full papers.

Name	Title	E-mail	Country
Miriam Amit	Excellence, Giftedness and Creativity: Do They Enhance Equity in a Multicultural Society?	amit@exchange.bgu.ac.il	Israel
Adnan Baki	Integration of technology into mathematics teaching: past, present and future	abaki@ktu.edu.tr	Turkey
Caroline Bardini	Epistemology as a magnifier lens for focusing our didactical view on students' understanding of algebra	cbardini@unimelb.edu.au	Australia
Rita Borromeo Ferri	Mathematical thinking styles and their influence on teaching and learning mathematics	borromeo@mathematik.uni-kassel.de	Germany
Humberto Bortolossi	Developing free computer-based learning objects for high school mathematics: Examples, issues and directions	hjbortol@gmail.com	Brazil
Marianna Bosch	The anthropological theory of the didactic as a new theoretical and methodological paradigm in mathematics education	mbosch@fundemi.url.edu mariannabosch@gmail.com	Spain
Jinfa Cai	Curriculum reform and mathematics learning: Evidence from two longitudinal studies	jcai@math.udel.edu	USA
Susana Carreira	Mathematical problem solving beyond school: digital tools and students mathematical representations	scarrei@ualg.pt	Portugal
Paulo Cezar Carvalho	The teaching of probability in the secondary school	pcezar@impa.br	Brazil
Kyung Yoon Chang	Mathematics alive!: Project-based mathematics	kchang@konkuk.ac.kr	Korea

Marcos Cherinda	Weaving exploration in the process of acquisition and development of mathematical knowledge	mcherinda@gmail.com	Mozambique
Brent Davis	Subtlety and complexity of mathematics teachers' disciplinary knowledge	brent.davis@ucalgary.ca	Canada
Michael de Villiers	An illustration of the explanatory and discovery functions of proof	profmd@mweb.co.za	South Africa
Tommy Dreyfus	Constructing abstract mathematical knowledge in context	tommyd@post.tau.ac.il	Israel
Paul Drijvers	Technology in mathematics education: why it works (or doesn't work)	p.drijvers@fi.uu.nl	Netherlands
Suely Druck	Mathematics olympiad with great social impact- a Brazilian experience	sdruck@uol.com.br	Brazil
Domingos Fernandes	TBA	dfernand@ie.ul.pt	Portugal
Lourdes Figueiras& Abraham Arcavi	Learning to see: The viewpoint of a blind mathematics teacher	lourdes.figueiras@uab.cat, abraham.arcavi@weizmann.ac.il	Spain Israel
Kgomotso Garegae	The pitfalls of unplanned planned ICT integration into mathematics curriculum in developing countries: the case of Botswana	garegae@mopipi.ub.bw	Botswana
Jonaki Ghosh	Learning mathematics in secondary School: The case of mathematical modelling enabled by technology	jonakibghosh@yahoo.co.in	India
Frederic Gourdeau	Doing mathematics in teacher preparation: giving space and time to think, reflect, share and feel.	frederic.gourdeau@mat.ulaval.ca	Canada
Ghislaine Gueudet	Resources, at the core of mathematics teachers' work	ghislaine.gueudet.1@univ-rennes1.fr	France
Markku Hannula	Emotions in problem solving	markku.hannula@zpg.fi	Finland
Lulu Healy	Hands that see, hands that speak: investigating relationships between sensory activity, forms of communicating and mathematical cognition	lulu@baquara.com	Brazil
Ilana Horn	Teachers learning together: Pedagogical reasoning in mathematics teachers' collaborative conversations	ilana.s.horn@vanderbilt.edu	USA
Maitree Inprasitha	How to transfer lesson study to outside Japan: A decade of Thailand experience	Inprasitha_crme@kku.ac.th	Thailand
Masami Isoda	Designing problem solving teaching approach for understanding mathematics: Hermeneutics, meaning and procedure for objectifying subjective	isoda@criced.tsukuba.ac.jp	Japan
Uffe Thomas Jankvist	History, application, and philosophy of mathematics in mathematics education	utj@imada.sdu.dk	Denmark
Okki Kang	Mathematical modeling in school mathematics	okkang@skku.ac.kr	Korea
Wan Kang	Polya and Krutetskii	wkang@snue.ac.kr	Korea
Matthias Kowski	TBA	kowski@asu.edu	USA
Christine Knipping	The social dimension of argumentation and proof in mathematics classrooms	knipping@math.uni-bremen.de	Germany
Alain Kuzniak	The role of reasoning in learning mathematics	kuzniak@math.jussieu.fr	France
Chronis Kynigos	Constructionism :Theory of learning or theory of design?	kynigos@ppp.uoa.gr	Greece
Sang-Gu Lee	Linear algebra with sage-math and the smartphone	sglee@skku.edu	Korea
Jianhua Li	The role of teacher in mathematics? Classroom in China:	lijianhua.bnu@gmail.com	China
Chap Sam Lim	Riding the third wave: Negotiating value preferences in effective mathematics lesson between teachers and pupils	cslim@usm.my	Malaysia
Auxencia A. Limjap	When best practices are not enough: Investigating the Influence of teachers' pedagogical beliefs and reported practices on student learning and achievement in mathematics	auxencia.limjap@dlsu.edu.ph	Philippine
Johan Lithner	Learning mathematics by creative or imitative reasoning	johan.lithner@matnvm.umu.se	Sweden
Allen Yuk Lun Leung	Forms of reasoning developed in dynamic geometry environment	aylleung@hkucc.hku.hk	Hong Kong
Yunpeng Ma	An analysis of the characteristics and strategies of the excellent teachers in mathematics lessons in primary school	mayp@nenu.edu.cn	China
Michela Maschietto	Teachers, students and resources in mathematics laboratory	maschietto.michela@unimore.it	Italy
Bill Mc Callum	The Implementation of the common core state standards for mathematics in the United States	wmc@math.arizona.edu	USA
Marta Menghini	TBA	marta.menghini@uniroma1.it	Italy
Ah Chee Ida Mok	Research on mathematics classroom practice: An international perspective	iacmok@hku.hk	Hong kong
Cecilia Mwathi	TBA	Cecelia_mwathi@yahoo.com	Kenya
Eizo Nagasaki	Mathematical literacy for living in the 21st century	nagasaki@nier.go.jp	Japan
Terezinha Nunes	On the nature of geometric work in compulsory education	terezinha.nunes@education.ox.ac.uk	UK
Masakazu Okazaki	Exploring the process of transition from elementary to secondary mathematics through classroom design experiments in collaboration with teachers	masakazu@cc.okayama-u.ac.jp	Japan
John Olive	Harnessing 21st century technologies to enhance the learning and teaching of mathematics: Research issues and examples	jolive@uga.edu	USA
Fidel Oteiza	Teacher's profile, teaching practices, technical assistance and the use of digital technologies in the mathematics classroom	fidel.oteiza@gmail.com	Chile
Maxine Pfannkuch	Laying foundations for statistical inference	m.pfannkuch@auckland.ac.nz	New Zealand
Luis Radford	TBA	lrادford@laurentian.ca	Canada
Yvan Saint-Aubin	The challenges of preparing a mathematical lecture for the public	saint@dms.umontreal.ca	Canada
Chris Sangwin	TBA	c.j.sangwin@bham.ac.uk	UK

Shailesh Shirali	Numerical analysis in school mathematics: An attempt to bridge the divide between school mathematics and the discipline of mathematics	shailesh.shirali@gmail.com	India
Blanca Souto Rubio	Visualizing mathematics at university? Examples from theory and practice of a linear algebra course	blancasr@mat.ucm.es	Spain
Michel Spira	On the golden ratio	michel@mat.ufmg.br	Brazil
Kaye Stacey	The international assessment of mathematical literacy: PISA 2012 framework and items	k.stacey@unimelb.edu.au	Australia
Gloria Stillman	Applications and modeling research in secondary classrooms: What have we learnt?	gloria.stillman@acu.edu.au	Australia
R. Sujatha	Mathematics education in India: Perspective and challenges	sujatha@math.tifr.res.in	India
Guenter Toerner	Hidden cultural variables to promote mathematics and mathematics education? are there royal roads?	guenter.toerner@uni-due.de	Germany
Tin Lam Toh	Mathematical olympiad and its impact on Singapore mathematics education	tinlam.toh@nie.edu.sg	Singapore
Zalman Usiskin	What does it mean to "understand" some mathematics?	z-usiskin@uchicago.edu	USA
Marja van den Heuvel-Panhuizen	Realistic mathematics education with vision	m.vandenheuvel@fi.uu.nl	Netherlands
Lyn Webb	The use of dialogue as a resource in multilingual mathematics classrooms	lyn.webb@nmmu.ac.za	South Africa
Woo Hyung Whang	Mathematics learning as a schematic expansion	wwhang@korea.ac.kr	Korea
Carl Winslow	Mathematics at University: The Anthropological Approach	winslow@ind.ku.dk	Denmark
Khoon Yoong Wong	Use of student mathematics questioning to promote active learning	khoonyoong.wong@nie.edu.sg	Singapore
Yingkang Wu	The examination system in China: the case of Zhongkao mathematics	ykwu@math.ecnu.edu.cn	China
Caroline Yoon	Mapping mathematical leaps of insight	c.yoon@auckland.ac.nz	New Zealand

Topic Study Groups

A Topic Study Group is designed to gather a group of congress participants who are interested in a particular topic in mathematics education. For ICME-12, the Topic Study Group is the major arena for participation. Participants are expected to associate themselves with one TSG and to stay in that group for all four sessions.

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 TSG will be organized by a team of five to six. Two co-chairs have been appointed for each team. Each TSG will include the host country, who, as well as being a member of the team, will be the liaison with the Local Organizing Committee for practical issues.

The purpose of the TSGs is to provide a forum for presentations and discussion on the current state-of-the-art in the topic, seen from an international perspective. One of the special features of ICME is that it is a place where different perspectives are welcomed and can cross-pollinate each other. By their very nature, some of the topics are focused more on research than on practice. For others the opposite will be the case, whereas other topics may have a fairly equal balance of the two.

At ICME-12, the TSGs will have four one and a half hour timeslots at their disposal. This makes TSGs the prime forum for participation. Every effort will be made to ensure that participants have an opportunity to present as part of a TSG. In order to maximize participation TSGs may organize their sessions differently; some participants may be asked to present within the TSG sessions; others may be asked to post papers for group discussion during TSG sessions; others may be asked to present poster sessions as part of the TSG.

Each TSG organizing team will have the responsibility of updating the web site linked to the congress website. On this site it will be possible to follow the planning process and eventually access all relevant documents including the timetable for TSG sessions. Participants who would like to present papers in a TSG are requested to communicate with the team chairs. The TSG teams are responsible for establishing a scheme for paper presentation by distribution, see; "How to contribute in its TSG website." Typically proposals should be put forward no later than November 30, 2011, but specific guidelines, if such apply, will be made available on the web site. If the proposal is accepted, the final draft should be submitted through on-line no later than April 10, 2012.

Deadline Summary

November 30, 2011 On-line submission of proposal

January 15, 2012 Notification of acceptance

April 10, 2012 On-line submission of final paper and description of programme items

TSG 1: Mathematics Education at Preschool Level

Aims

This topic study group of ICME 12 aims to provide a forum for exchanging insights in early mathematical learning derived from work in different research fields such as cognitive and developmental psychology, neuroscience, mathematics education and Early childhood education. The purpose is to build a picture of early mathematics learning based on a sound foundation. While much research has focused on children's learning of number, a growing body of work examines the learning of geometry and measurement in pre-school. TSG 1 will provide a forum for sharing this work and also explore how the learning of these aspects of mathematics in pre-school can be strengthened. The expansion of pre-school education in many countries, the realization that pre-school learning can have potential long-term positive effects on mathematical learning and increasing awareness about the needs of young children at-risk for mathematics difficulties, provide an immediate practical context for application of theoretical and empirical research. TSG-1 will hence include in its scope the connection between research studies and improvement of instruction, and the refinement of teaching and assessment resources.

Guidelines for submission

We invite to submissions of abstracts (maximum of 500 words) to TSG1. Submissions could fall into (but are not limited to) the following themes:

- Improving early childhood mathematics learning: connecting research to practice
- Geometry and measurement in pre-school and toddler age.
- Mathematics through play or instruction? Tools for learning
- Pre-school teachers professionalism in mathematics education
- Readiness for success in school. Level of early mathematics a predictor for later mathematical outcomes?
- Different research designs in studies of early mathematics learning
- Methods in observing and assessing mathematics in early childhood
- Early childhood mathematics and relation to other developmental areas

On-line submission

Go to <My Page> at the first page of the Congress Homepage(<http://icme12.org>) or press <Submit your proposal> button on TSG 1 website in the Congress Homepage.

Deadlines

November 30, 2011: Deadline of submission of all Abstracts (maximum of 500 words)

January 15, 2012: Notification of acceptance of Abstracts

April 10, 2012: Submission of final paper (max 3000 words) and description of programme items

Organizers

Co-chairs: Elin Reikeras(Norway) elin.reikeras@uis.no

Merilyn Taylor(New Zealand) meta@waikato.ac.nz

Team Members: Haekyung Hong(Korea) hkhong@jnu.ac.kr

Camilla Bjorklund(Finland) camilla.bjorklund@abo.fi

Liaison IPC Member: K. (Ravi) Subramaniam subra@hbcse.tifr.res.in

TSG 2: Mathematics Education at Tertiary Level and Access to Tertiary Level

Aims

Research in mathematics education at the tertiary level has experienced tremendous growth over the last two decades. While many of mathematics lecture halls are still dominated by instructor's "chalk and talk" and students taking notes, others engage in creative explorations, the use of technology and problem solving. The aim of this Topic Study Group will be to explore recent trends and developments from around the world. The topic is broad, not only because of the geographical variety, but also because of diversity in customers Mathematics at tertiary level is taken by future research mathematicians, taking advanced abstract courses, future consumers of mathematics doing business calculus, liberal arts students relearning basic algebra to comply with "numeracy" requirement, and future teachers of mathematics, to mention just a few target groups and levels. In this group we will also address transition problems from school to

university.

Difficulties in mathematics education at the tertiary level are widely acknowledged. But there are also interesting examples of attempts to meet these difficulties successfully. Such development work is often known only locally and therefore there is need to gather these success stories together and share and further develop the ideas involved.

Therefore in TSG 2 we are interested in papers connected to one of the following areas:

- Recent research in mathematical education at the tertiary level varying from relevant approaches to learning to design of learning environment and uses of technology.
- Successful attempts to develop teaching of mathematics at the tertiary level.
- Other relevant areas...

Guidelines for submission

TSG 2 will meet for four sessions of 1.5 hours each. The structure and organization of these sessions will depend upon the proposals submitted. The organizing team invites submissions of proposals for oral presentations or posters relevant to the aims and focus of TSG 2 as described above. We expect that most contributions will address one or more of the issues and questions identified above. The official language of the congress is English and proposals should be presented primarily in English.

- Brief proposals for papers and posters (1000 - 1200 words) should be submitted electronically by Nov 1, 2011 both through the online submission system at the ICME-12 official website and by email to the co-chairs of the TSG 2 (see below for email address of co-chairs).
- Indicate whether your proposal is for a poster or an oral presentation. If your proposal is accepted, you will be invited to prepare a paper of no more than 8 pages in the ICME-12 template to be submitted through the TSG 2 online submission system by 10 April 2012. The template can be found at the ICME-12 website.
- Poster presentations will be allocated time for discussion
- Time allocation and other details (parallel or not) about the oral presentations will be decided upon depending on the number of proposals received
- In case of queries and clarifications contact the two co-chairs

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 2 website in the Congress Homepage.

Deadlines

November 30, 2011: Proposal submission

January 15, 2012: Notification of acceptance

April 10, 2012: Submission of final paper and description of programme items

Organizers

Co-chairs: Ansie Harding(South Africa) aharding@up.ac.za

Juha Oikkonen(Finland) Juha.Oikkonen@helsinki.fi

Team Member: Sepideh Stewart(New Zealand) stewart@math.auckland.ac.nz

Miroslav Lovric(Canada) lovric@mcmaster.ca

Sung-Ok Kim(Korea) sokim@handong.edu

Liaison IPC Member: Johann Engelbrecht Johann.Engelbrecht@up.ac.za

TSG 3: Activities and Programs for Gifted Students

Aims

The aim of TSG 3 is to gather educational researchers, research mathematicians, mathematics teachers, teacher educators, designers and other congress participants for the international exchange of ideas related to identifying and nourishing mathematically gifted students.

The focal topics will include but not bounded to:

- Theoretical models of giftedness and the relationship between creativity and giftedness;
- Empirical research that will contribute to the development of our understanding in the field. We plan to discuss:

- effective research methodologies and research innovations (e.g., brain research) in the field of mathematical giftedness;
- the findings of qualitative and quantitative studies related to high mathematical promise, its realization, and
- the relationship between mathematical creativity and mathematical talent.
- Profiles of the gifted child: their range of interests, ambitions and motivations, social behaviour, how and at what age their giftedness is discovered or developed.
- Instructional design directed at teaching the gifted as well as development of appropriate didactical principles. The discussions will be focused on:
 - the ways that lead students to discover and realize their mathematical talents;
 - the ways of developing mathematical innovation at high level;
 - mathematical activities that are challenging, free of routine, inquiry-based, and rich in authentic mathematical problem solving;
 - types of mathematics suitable for challenging gifted students;
 - creation of mathematics challenges;
 - out-of-school ways of fostering giftedness, e.g., mathematics clubs, homeschooling, mathematical shows and competitions.
- Teacher education aimed at mathematics teaching that encourages mathematical promise and promotes mathematical talents, including:
 - issues of the psychology of teaching talented students;
 - socio-cultural and affective characteristics of the mathematically gifted;
 - types of mathematics and pedagogy suitable for educating teachers for the gifted.

Guidelines for submission

The organizing team welcomes significant contributions related to the topics outlined here and to other related issue. Participants are requested to submit a paper no later than November 30, 2011 both via e-mail to the two team chairs and through the online submission system at the ICME-12 official website. The length of contributions should be between 2000 and 3000 words in length.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 3 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Endnotes

1. The work of our group is related to the work of International Group for Mathematical Creativity and Giftedness (<http://igmccg.org/> ; <http://www.mathunion.org/icmi>)
2. The work of our group is a continuation of
 - TSG4 at ICME 10 in Copenhagen, Denmark <http://www.icme10.dk/>
 - TSG6 at ICME-11, in Monterrey, Mexico <http://tsg.icme11.org/tsg/show/7>
 - ICMI Study 16, Challenging Mathematics in and beyond the Classroom (<http://www.amt.canberra.edu.au/icmis16.html>) Chaired by E. Barbeau, P. Taylor

Organizers

Co-chairs: Peter Taylor(Australia) pjt013@gmail.com

Roza Leikin(Israel) rozal@construct.haifa.ac.il

Team Members: Linda Sheffield(USA) sheffield@nku.edu

Victor Freiman(Canada) freimanv@umoncton.ca

Florence Mihaela Singer(Romania) mikisinger@gmail.com

Bo Mi Shin(Korea) *bomi0210@jnu.ac.kr*

Liaison IPC Member: Shiqi Li *sqli@math.ecnu.edu.cn*

TSG 4: Activities and Programs for Students with Special Needs

Aims

Around the world, a considerable number of primary and secondary teachers are involved in teaching mathematics to students with special educational needs ("SEN-S") and a fair proportion of teacher educators are involved in preparing these teachers. But both, teachers and educators, very often are working under somewhat isolated circumstances. They are isolated geographically it is not always easy to identify others working with SEN-S regionally, let alone nationally or internationally. And they are also isolated in terms of particular focus specialists working with blind students, for example, may have little professional contact, if any, with specialists in the education of deaf students and those of Down's syndrome. Professional groups tend to be based more on the nature of the special needs of the students rather than on the learning of mathematics. This means that in the dialogue amongst educators concerned with SEN-S, mathematics education is hardly ever at centre stage. On the other hand, mathematics education researchers and teachers seldom have the specific knowledge about SEN-S. Mathematics educators do consider what mathematics for all should be, but the "all" rarely include SEN-S. Issues related to the mathematics education of students with special educational needs are currently under represented in the research community. What seems to be lacking is a community of mathematics educators dedicated to exploring this domain. Hence, there is a need to create common references and shared resources (in particular in the case of inclusive education). In short, there is a strong need for a common culture of mathematics education for students with special educational needs.

What could Mathematics Education gain from the establishment of such common references and resources?

First, mathematics education could become more significant in the lives of many students. There is a large number of young people and adult students for whom mathematics teaching may be "secondary" because the focus of their education is elsewhere. This is, for example, the case of deaf students: the major focus of their education is on language acquisition and literacy, and consequently their mathematics education is relatively neglected in research and curriculum development.

Second, insights developed in research with SEN-S could benefit mainstream mathematics teaching, through a re-analyses of assumptions about how mathematics is learned and what specific assessments tell us about students' abilities. Work with blind students, for example, can pose a challenge for the usual written tradition of schooling in general, and mathematics education in particular.

Third, SEN-S may show unexpected dissociations between different aspects of mathematical knowledge. It is possible to find, for example, exceptional computational skills with little understanding of their conceptual basis in autistic children but conceptual understanding that surpasses what one would expect from the level of basic skills can also be found. Comparative research across different types of SEN would be crucial for thinking about such dissociations in novel ways. Finally, the discussion of different sorts of curricula with different resources appropriate for mathematics teaching while keeping mathematics as the focus of the discussion could lead to more diversified approaches to mathematics education.

Call for contributions

We invite submission of proposals for contributions to TSG-4 that could fall into the following themes and issues:

1. International surveys of some educational systems for students with special needs, the practices utilized in the identification of students who face particular challenges in learning mathematics, the legislated support for those identified and the strategies particular to mathematical education.
2. Considerations of impact the worldwide move to "inclusive education" on the mathematics curriculum and classroom practices and the challenges for mathematics teachers associated with the trend in shift the educational responsibility for students with special needs from 'special' to mainstream schools.
3. International surveys of teacher education programs (pre-service and in-service) to prepare mathematics teachers to work with students with special needs, either in specialist schools or in inclusive mathematics classrooms.
4. Activities and programs for
 - students with sensory and physical difficulties (including for example, hearing impairment, visual impairment), physical and medical difficulties (including Cerebral palsy, students with Down's syndrome and traumatic brain injury).
 - students with cognition & learning difficulties (which would cover moderate, severe and specific learning difficulties)

in mathematics like dyscalculia, dyspraxia etc.).

- students with emotional and behavioural difficulties conditions such as Attention Deficit Disorder or hyperactivity, as well as student's with emotional difficulties leading to lack of self-esteem, lack of concentration, depression etc.
 - students with communication and interaction difficulty, this would cover students with Autism or conditions such as Asperger's syndrome etc.
5. What theoretical frameworks and methodologies are helpful in understanding issues related the mathematics education of students with special needs?
 6. Semiotic approaches, language and communication in Mathematics Education for SEN-S.
 7. Embodied and (multi-)cultural approaches to Mathematics Education for SEN-S.
 8. Assessment of teaching mathematics for SEN-S (in particular, long term gains).
 9. Pre-service and in-service teacher education in Mathematics for SEN-S.
 10. Forms of teaching and research co-operations between researchers, educators and teachers in Mathematics Education for SEN-S.

Types of presentations

We welcome different types of presentations for effective communication. Contributions on the above themes and issues could include the following types of presentations:

1. Research papers (e.g., regular reports on research projects and results, with discussion)
2. Short oral presentations (e.g., brief communication of research agenda or issues)
3. Poster presentations (e.g., dynamic communication through a visual display)

Guidelines for submission

First descriptions of proposals may be limited to about 1000 to 1500 words, whereas end-versions, to be produced afterwards, may differ in length due to the type of proposal. Any proposal can be submitted to the co-chairs of the TSG 4 by e-mail and by the online submission system at the ICME-12 website (<http://www.icme12.org>).

On-line submission

Go to<My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 4 website in the Congress Homepage.

Deadlines

November 30, 2011 Submission of proposal

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final paper and description of programme items

Organizers

Co-Chair: Jean-Philippe Drouhard(France) jpdrouhard@gmail.com

Sung-kyu Choi(Korea) skchoi@daegu.ac.kr

Team Member: Heloza Barbosa(Brazil) heloiza@hbarbosa.org

Petra Scherer(Germany) petra.scherer@uni-due.de

Jacinthe Giroux(Canada) giroux.jacinthe@uqam.ca

Liaison IPC Member: Bernard Hodgson bhodgson@mat.ulaval.ca

TSG 5: Mathematics Education in and for Work

Aims

The aim of TSG 5 at ICME-12 is to bring together researchers, practitioners and policy makers in mathematics education, adult education, workplace education, adult numeracy education, citizenship education, social movement education - for the exchange of ideas related to mathematics education in and for work.

We view mathematics to be inclusive of the formal academic discipline of mathematics as well as the range of practices in which mathematics is embedded.

We view education to be inclusive of formal, informal and non-formal learning, that is, in education settings (e.g. adult community education, vocational and further education) as well as in the community and workplaces; and both

individual and collective learning.

We view work to be inclusive of paid work and unpaid work such as work in the home, and activist work in social movements.

The focal topics will include empirical, theoretical and methodological issues related to questions like:

- How is mathematics embedded in work practices; what is this mathematics like and how is it learned?
- What mathematics do people learn in preparation for work?
- How is mathematics/ numeracy valued for and in employment in different societies?
- How does the mathematics taught and learned for work differ/match the mathematics used in work?
- How does the mathematics learning in and for work meet people's mathematical needs in other domains of their lives?

We hope to see exchanges of ideas and information from people working on these and related topics from different theoretical perspectives, in different policy and cultural contexts. The purpose is to develop rich and critical insights into what might be meant by 'mathematics in and for work'.

Guidelines for submission

The organizing team welcomes significant contributions related to the topics outlined here and to other related issues. Participants are requested to submit proposals for a paper not later than November 30, 2011 both via e-mails to the two team chairs and through the online submission system at the ICME-12 website. The length of contributions should be between 1500 and 2000 words in length. The final paper to be presented may be longer than this.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 5 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Tine Wedege(Sweden) tine.wedege@mah.se

Keiko Yasukawa(Australia) Keiko.Yasukawa@uts.edu.au

Team Members: Corinne Hahn(France) hahn@escp-eap.net

Ok-Kyeong Kim(Korea) ok-kyeong.kim@wmich.edu

Geoff Wake(UK) geoffrey.wake@nottingham.ac.uk

Rudolf Straesser(Germany) rudolf.straesser@math.uni-giessen.de

Liaison IPC Member: Morten Blomhoej blomhoej@ruc.dk

TSG 6: Mathematics Literacy

Aims

The purpose of Topic Study Group 6 is to gather participants from different parts of the world with an interest in and/or experiences of the notion and role of mathematical literacy in the practice, research and development of mathematics education at all levels. Our hope is that participants in this TSG will exchange and share views, experiences, projects, analyses, research and development studies so as to bring a thorough and systematic exploration of our topic - mathematical literacy - forward.

The themes of this TSG include:

1. *Conceptual clarification of the notion(s) of mathematical literacy:*
What are the different notions of mathematical literacy and how are they related to / distinct from "neighbouring" notions such as numeracy, quantitative literacy, mathematical competence, mathematical proficiency?
2. *The role and use of mathematical literacy in the teaching and learning of mathematics:*
Where, and for what purposes, is mathematical literacy on the agenda of mathematics education? How is mathematical literacy implemented in education programmes and curricula? as a separate subject or as an integrated

part of mathematics - and what teaching / learning activities and materials exist? How does a focus on mathematical literacy influence pre-service and in-service teacher education?

3. *The role and impact of mathematical literacy in national or international comparative studies:*

How is mathematical literacy situated in comparative studies in mathematics education, nationally or internationally, and how is mathematics education being influenced by literacy based studies, for better and for worse?

4. *What do we gain, or lose, from placing an emphasis on mathematical literacy?:*

What new and valuable outcomes can be gained from focusing on mathematical literacy instead of or in addition to traditional mathematical knowledge and skills? What problems or pitfalls may result from such a focus? What are the likely desirable or undesirable changes of practices in mathematics education resulting from a mathematical literacy focus?

Guidelines for submission

The organizers of the TSG welcome theoretical and empirical contributions to these themes in the form of research papers or reports on development projects. The organizers would also welcome proposals for additional themes to be considered by the TSG.

Contributions may be of two kinds:

- Theoretical or empirical research or development papers (2000 words, including references)
- Short presentations (500 words, including references)

Each submitted paper should contain

- The title, including sub-title, if appropriate
- The name of the author(s), affiliation(s) and country(ies), and contact details
- A brief abstract
- A clear description of the purpose, content, methodology, and main conclusions of the study or project

Contributed papers should be submitted no later than November 30, 2011 both via e-mails to both co-chairs and through the on-line submission system at the Congress Website. Notification of acceptance/non-acceptance of proposals will be sent by January 15, 2012. In addition to contributed papers, the organizers may want to invite commissioned papers to inform the work of the TSG. The final draft of the scientific programme of TSG 6 is due on April 10, 2012.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 6 website in the Congress Homepage.

Organizers

Co-chairs: Hileni Kapenda(Namibia) hkapenda@unam.na

Mogens Niss(Denmark) mn@ruc.dk

Team members: Eduardo Mancera(Mexico) eduardo_mancera@prodigy.net.mx

Gwisoo Nah(Korea) gsna21@cje.ac.kr

Jianming Wang(China) jmingwang@163.com

Liaison IPC Member: Michèle Artigue michele.artigue@univ-paris-diderot.fr

TSG 7: Teaching and Learning of Number Systems and Arithmetic (Focusing especially on Primary Education)

Aims

The group's focus is on individuals' elementary mathematical representations and understandings with a special interest in the way these aspects of cognition develop through activities in and out of school. The mathematical domains of concern include whole numbers, integers, and rational numbers as well as representations related to each of these domains.

A related interest of the group is socio-cultural analyses. These analyses would include the ways that mathematics (including mathematical argumentation, representations, problem solving, teaching-learning interactions) is constituted in everyday practices as well as the interplay between developing mathematical understanding and representations in and out of school.

The group encourages cross-disciplinary contributions, including (but not limited to) participation by educational

researchers, mathematics educators, developmental psychologists, and cultural anthropologists.

Guidelines for submission

The organizing team welcomes contributions to the topics outlined above as well as related issues. Participants are requested to submit 1500-2000 word proposals not later than November 30, 2011 both via e-mail to the team chairs and through the on-line submission system at the Congress Website. The proposals should indicate name(s) of the author(s) and their location (town and country, school or institution) and contact details.

The members of the organizing group will review each proposal, and the reviews will be returned by **January 15, 2012**. For accepted papers, the final versions must be returned by **April 10, 2012** (and may be longer than the 1500-2000 word proposal limit). Any question that you might have, please send an email to any member of the group.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 7 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission (1500-2000 words)

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Joana Brocardo(Portugal) joana.brocardo@ese.ips.pt

Geoffrey Saxe(USA) saxe@berkeley.edu

Team Members: Josephus Klep(The Netherlands) Josephus.Klep@math.uni-giessen.de

Maria Lucia Faria Moro(Brazil) mlfmoro@sul.com.br

Minkyung Kim(Korea) mkkim@ewha.ac.kr

Liaison IPC Member: K.(Ravi) Subramaniam subra@hbcse.tifr.res.in

TSG 8: Measurement - Focusing Especially on Primary Education

Aims

Measurement - as well as related topics of geometry - forms an important mathematics domain on the level of both primary school and pre-vocational secondary school in many countries. At this level it relates primarily to quantifying certain aspects of real world physical objects such as the length, area, capacity, weight/mass, temperature or volume of objects, and to the reconstruction and application of the current measuring systems in a country (metrical or non-metrical). It also includes the use of measuring instruments such as the folding ruler and measuring tape, the measuring jug and the kitchen scale.

Related geometrical topics include understanding of and working with the concept of scale, and the reconstruction and application of formulas for the area of a rectangle, triangle and other geometrical figures.

Although measurement and related geometry are widely considered an essential part of the curriculum, in many countries there seems to be a lack of attention to this domain, especially as far as practical measuring activities are concerned. Research suggests that it is mainly a lack of insight in the basic principles of measurement of students that sometimes leads to a poor knowledge of this domain.

TSG-8 addresses researchers, curriculum developers and reflective practitioners (teachers) working in the field of measurement and related geometry on the level of primary school. It aims at providing a forum for generating discussion, exchanging insights and establishing a state of the art sketch of the domain, including indications for the status of measurement as a foundation for advanced mathematics domains such as statistics and integral calculus.

Call for contributions

We invite submission of proposals for contributions to TSG-8 that could fall into (but are not restricted to) the following themes and issues:

- Theoretical perspectives on mathematical growth of students' thinking related to measurement;
- The development of measurement sense in students as a foundation for grasping the basic principles of measurement;

- Connections between measurement and related domains such as number sense and decimal numbers;
- Curriculum development and implementation related to measurement, for instance comparative analysis of different measurement curricula;
- Instructional approaches to foster students' development related to measurement;
- Methods of observing and assessing mathematical proficiency related to measurement, for instance tools to assess students' ability or growth in measurement;
- Understanding of students' successes and difficulties in measurement and related geometry, for instance problems with the reconstruction and application of formulas for the area and perimeter of rectangular figures;
- Culturally defined tools and practices for measurement and cultural supports for the learning and teaching of measurement.

Types of presentations

We welcome different types of presentations for effective communication. Contributions on the above themes and issues could include the following types of presentations:

- Research papers (e.g., regular reports on research projects and results, with discussion)
- Short oral presentations (e.g., presentations related to reflected instructions on measurement (such as best practice lessons), or brief communication of research agenda or issues)
- Poster presentations (e.g., dynamic communication through a visual display)

Guidelines for submission

First descriptions of proposals may be limited to about 1000 to 1500 words, whereas end-versions, to be produced afterwards, may differ in length due to the type of proposal. Any proposal can be submitted both via e-mail to the co-chairs of the TSG 8 and by the online submission system at the ICME-12 website (<http://www.icme12.org>).

TSG-8 will meet for four sessions of 1.5 hours each, taking place on Tue., Wed., Fri. and Sat. morning during the conference. The structure and organization of these sessions will depend upon the proposals submitted.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 8 website in the Congress Homepage.

Deadlines

November 30, 2011 Submission of proposal

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final paper and description of programme items

Organizers

Co-chairs: JeongSuk Pang(Korea) jeongsuk@knue.ac.kr

Kees Buijs(Netherlands) c.buijs@slo.nl

Team Members: Olimpia Figueras(Mexico) figuerao@cinvestav.mx

Silke Ruwisch(Germany) ruwisch@uni.leuphana.de

Andrea McDonough(Australia) andrea.mcdonough@acu.edu.au

Liaison member: K.(Ravi) Subramaniam subra@hbcse.tifr.res.in

TSG 9: Teaching and Learning of Algebra

Aims

Topic Study Group 9 aims to bring together researchers, developers and teachers who investigate and develop theoretical accounts of the teaching and learning of algebra. The group also welcomes empirically grounded contributions that focus on the learning and teaching of algebra in diverse classrooms settings, and on the evolution of algebraic reasoning from elementary through university schooling.

The organizing team is calling for papers for TSG 9. We invite papers which address one or more of the following issues in the teaching and learning of algebra.

1. Issues related to early algebra, like what is its nature; children's capabilities in thinking algebraically and dealing with

symbols; early algebra's contribution to children's later understanding of middle/ secondary school algebra; challenges involved in doing "early algebra" in the classroom: what works, what does not.

2. Issues related to the use of ITC in algebra classrooms, like affordances and challenges of using ITC for teaching and learning of algebra; effective use of ITC; similarities and differences in the nature of paper-and-pencil based algebra and ITC based algebra; its contribution to our understanding of students' thinking about algebra and development of algebraic thinking among students, including understanding of symbols and their manipulation.
3. Issues related to proof and proving, like students' understanding of proof in algebra; difficulties which students face in the process of proving; how do ideas of proof and proving develop among students; cognitive processes which help in the process; role of representations and understanding of goal/ task; role of language and communication; classroom environments and tasks which help in developing these ideas, role of ITC.
4. Issues related to problem solving, like how to inculcate problem solving skills; students' difficulties with solving problems; thinking processes which lead to successful/ unsuccessful problem solving; role of representations, symbols and symbolic manipulation, role of ITC.
5. Issues related to the process of generalization, like student's use of representations and gestures to explore and express patterns; difficulties which students face in the process of generalizing; student's understanding of generalizations expressed either verbally or symbolically; the use of generic examples versus successions of particular cases in generalization processes; generalization and abstraction.
6. Issues related to ways in which semiotics helps us understand the processes of communicating and signifying in the teaching and learning of algebra in which the elaboration and use of new sign systems are involved, students' developing ideas about algebraic symbols, meaning making of new symbols.
7. Issues related to designing of algebra curriculum, like approaches to introducing algebra; students' understanding of algebra in the context of a particular curriculum; cross-country comparison; features of curricular material which supports students' algebraic thinking.

Guidelines for submission

1. Indicate name(s) of the author(s) and their location(town and country, school or establishment) and contact details.
2. Write a paper of about 8 pages (14 pt, single spaced, Times New Roman) including references. The paper should describe the context of the study, methodology used, and description of analysis of data and discuss the major findings.
3. Submit by November 30, 2011 both via email to the co-chairs and through on-line.

Deadlines

November 30, 2011 Proposal submission (1500-2000 words)

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

On-line submission

Go to<My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 9 website in the Congress Homepage.

Organizers

Co-chairs :Rakhi Banerjee(India) rakhi.banerjee@gmail.com, rakhi@aud.ac.in

Luis Puig(Spain) luis.puig@uv.es

Team Members: Swee Fong Ng(Singapore) sweefong.ng@nie.edu.sg

Armando Solares(Mexico) asolares@cinvestav.mx

Hwakyung Kim(Korea) hwakyung@gmail.com

Liaison IPC Member: Masataka Koyama mkoyama@hiroshima-u.ac.jp

TSG 10: Teaching and Learning Geometry

Aims

This group provides a forum for discussion of the teaching and learning of geometry, with a focus especially on the middle and secondary school and university levels. This Group will have short presentations on, and discussions of, important new trends and developments in research or practice, in geometry teaching and learning, and expositions of

outstanding recent contributions to it. The focus of the group will be on theoretical, empirical, or developmental issues related to the following themes:

- Curriculum studies of new curriculum implementation,
- An application of geometry on the real world and other subjects
- The use of instrumentation such as computers in teaching and learning of geometry,
- Explanation, argumentation and proof in geometry education
- Spatial abilities and geometric reasoning about two-dimensional and three-dimensional shapes.
- Teacher preparation in geometry education.

The issues raised will be considered from the historical and epistemological, cognitive and semiotic, educational points of view related to students' difficulties and related to the design of teaching and curricula.

Presentation of the TSG

This group provides a forum for discussion of the teaching and learning of geometry, with a focus especially on the middle and secondary school and university levels. This Group will have short presentations on, and discussions of, important new trends and developments in research or practice, in geometry teaching and learning, and expositions of outstanding recent contributions to it.

The focus of the group will be on theoretical, empirical, or developmental issues related to the following themes:

- Curriculum studies of new curriculum implementation, challenges and issues, discussion of specific issues such as place and role of vectors and transformations
- An application of geometry on the real world and other subjects, in particular on mathematics
- The use of instrumentation such as computers in teaching and learning of geometry,
- Explanation, argumentation and proof in geometry education
- Spatial abilities and geometric reasoning about two-dimensional and three-dimensional shapes.
- Teacher preparation in geometry education.

The issues raised will be considered from the historical and epistemological, cognitive and semiotic, educational points of view related to students' difficulties and related to the design of teaching and curricula.

TSG 10 "Teaching and Learning Geometry" invites the submission of contributions related to the topic of the group. In particular, any contribution addressing questions, problems and issues related to the presentation of the topics listed above can be submitted. The organizers of the Topic Study Group welcome proposals from both researchers and practitioners and encourage contributions from all countries with different economic contexts and cultural backgrounds. Reflecting the diversity of the contributions is a major concern of the group organizers.

The submitted contributions will be reviewed by the organizing team of the Topic Study Group. The accepted contributions will be published on the ICME website before the congress and presented either in oral presentations or in a poster session within the slots of the group. During this session, it is expected that the contributors will be available to discuss their work with the other group members. Presentations related to technology may also include live demonstrations of new technologies. Contributors will also be invited to bring copies of accepted papers, including expanded versions, and CDs to be presented-by-distribution during this session.

Submissions

The first version of submissions can be a short proposal of 3 pages, clearly indicating the aims and the nature of the work, synthesizing its content and results. Authors of accepted submissions will send later a longer version for publication of 7 pages on the Web site of the congress, presenting the aims and the nature of the work, the underlying theoretical frameworks or assumptions, the ways it was carried out or the methods that were used, and provide the results and/or questions coming from the work.

Submissions could report on research work as well as teaching work in classrooms, or on the design of geometry curricula, teaching units or computer geometry environments. They also could address theoretical issues by reporting on advances made in the development of theoretical frameworks or approaches.

Sending submissions

Submissions in their short form (3 pages) or in their final form (7 pages) should be sent by November 30, 2011 either as an email attachment to both chairs of the TSG 10 and through the on-line submission at the Congress website.

Information about acceptance of the submissions with recommendations for the final version will be available by January 15, 2012. Final versions of accepted submissions should be sent by April 10, 2012.

Scheme for paper presentation

Final texts should be 7 pages (Times 12, single-spaced lines) and fit into an outline of 16 cm x 25 cm. Each submission must:

- be in .pdf file
- be written in English
- have a title (bold, capital, centered, Times 16)

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 10 website in the Congress Homepage.

Deadlines

November 30, 2011 On-line submission of proposal

January 15, 2012 Notification of acceptance

April 10, 2012 On-line submission of final paper and description of programme items

Organizers

Co-chairs: Colette Laborde(France) labordec@cabri.com

Linquan Wang(China) ludwig@math.uni-frankfurt.de

Team Members: Matthias Ludwig(Germany) ludwig@ph-weingarten.de

Nathalie Jakucyn(USA) njakucyn@glenbrook225.org

Joong Kweon Lee(Korea) joonglee@dongguk.edu

Elfrida Ralha(Portugal) eralha@math.uminho.pt

Liaison IPC Member: Hee Chan Lew hclew@knue.ac.kr

TSG 11: Teaching and Learning of Probability

Aims

Probability has strong roots in the curricula of many countries but is relatively new in others. Traditionally, the teaching of probability concerns two different interpretations of probability: 1) a classical conception, where probability is based on combinatorics or formal mathematics, and 2) a frequency conception, where probability is based on empirical evidence and long-termed behaviour of random phenomena. Topic Study Group 11 will try to look beyond these two interpretations and consider as its primary focus how to teach probability in ways that develop understanding and support using probability to help people make rational decisions in situations that affect their lives and their work. When we refer to the notion of probability we also include aspects of chance, randomness, risk and its relationship to statistics.

The group particularly encourages contributions from researchers, curriculum developers and teachers on:

1. Theories and frameworks for understanding teaching and learning probability.
2. The applications or values of probability in the real world and in other subjects and corresponding implications for curriculum.
3. The nature and development of teachers' knowledge for the teaching and learning probability.
4. The teaching of probability, including approaches that are accessible and motivating.
5. Student's thinking of probability and the interplay between personal beliefs, intuitions and notions of probability.
6. The nature of probability and on the distinctions between different philosophical/theoretical interpretations of probability (e.g., classical, frequentist, subjective, logical and propensity).

Guidelines for submission

During the conference, Topic Study Groups will have four one and a half hour timeslots at their disposal. The final program of TSG 11 will be decided by the Organizing Team of the group depend upon the proposals submitted, but we plan to include invited talks, selected oral presentations, and discussions around accepted papers in the program.

Proposals of 1000 - 1500 words in English should be submitted electronically) by November 30, 2011 both via e-mails to the co-chairsof the TSG 11 (see below) and through the on-line submission system at the Congress Website. It should include the following content:

Title, Name(s) and e-mail addresses of the author(s),

Institution,
Country,
Abstract,
Main text,
References (optional), and
Appendices (optional).

If your proposal is accepted, you will be invited to prepare a paper of no more than 8 pages (including references and appendices) in the ICME-12 template. The template can be found at the ICME-12 website.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 11 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Per Nilsson(Sweden) Per.Nilsson@vxu.se

Jun Li(China) lijun@math.ecnu.edu.cn

Team Members: Kyung-Hwa Lee(Korea) khmath@snu.ac.kr

Efi Paparistodemou(Cyprus) paparistodemou@cytanet.com.cy

Egan Chernoff(Canada) egan.chernoff@usask.ca

Enriqueta Reston(Philippines) edreston@yahoo.com

Liaison IPC Member: Gail Burrill burrill@msu.edu

TSG 12: Teaching and Learning of Statistics

Aims

Being able to provide sound evidence-based arguments and critically evaluate data-based claims are important skills that all citizens should have. It is not surprising therefore that statistics instruction at all educational levels is gaining more students and drawing more attention than it has in the past. The study of statistics provides students with tools, ideas and dispositions to use in order to react intelligently to information in the world around them. Reflecting this need to improve students' ability to think statistically, statistical literacy and reasoning are becoming part of the mainstream school and university curriculum in many countries.

As a consequence, statistics education is a growing and exciting field of research and development. Statistics at school level is usually taught in the mathematics classroom in connection with learning probability. Our topic includes probabilistic aspects in learning statistics, whereas research with a specific focus on learning probability is being discussed in TSG11 of ICME-12.

Within this broad domain and across educational levels, TSG12 welcomes presentations on the following topics:

1. Students' reasoning about key statistical concepts, such as data, distribution, variability, comparing distributions, sample and sampling, and covariation;
2. Students' making statistical inferences (from informal inference to more formal inference, role of context, randomness, models and probability in the inferential process, etc.);
3. Statistical literacy (its role in the curriculum, the challenges in preparing teachers to teach with statistical literacy as a goal);
4. Role of technology in teaching and learning statistics (including software packages, simulations, Internet, online teaching, etc.);
5. Preparing teachers to teach statistics;
6. Teaching statistics, with particular attention to research on how to structure learning sequences that enable students to develop over time a deep conceptual understanding;
7. Building a common research basis that will enable the field of statistics education to move forward, in particular

innovative ways to connect data and chance.

The purpose of TSG12 is to provide a forum for presentations of high-quality studies and discussions on the current state-of-the-art in these themes, seen from an international perspective as well as perspectives of different countries and cultures. During the conference, TSG12 will convene for four one and a half hour timeslots.

Guidelines for submission

Participants who would like to present their research in TSG12 are requested to submit proposals in English of up to 1,200 words by November 30, 2011 both via e-mail to the co-chairs and through the on-line submission system at the Congress Website. The proposal should include a title, author(s)' name, e-mail, institution and country, abstract (200 words), introduction, brief literature review, methodology, key results, and references.

The proposals will be peer-reviewed, and if your proposal is accepted, you will be invited to prepare a paper of no more than 8 pages (including references and appendices) using the ICME-12 template to be appeared in the Congress website. The final accepted papers should be submitted in the TSG12 Website no later than April 10, 2012.

The final program of TSG12 will be decided by the Organizing Team. We plan to include invited talks, selected oral presentations, posters and rigorous discussions around key issues in the study of statistics education.

On-line Submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 12 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final manuscript

Organizers

Co-chairs: Dani Ben-Zvi (Israel) dbenzvi@univ.haifa.ac.il

Jean-Claude Oriol (France) jeanclaude.oriol@gmail.com

Lisbeth Cordani (Brazil) lisbeth@ime.usp.br

Team Members: Katie Makar (Australia) k.makar@uq.edu.au

Arthur Bakker (the Netherlands) a.bakker4@uu.nl

Jangsun Baek (Korea) jbaek@jnu.ac.kr

Liaison IPC Member: Gail Burrill burrill@msu.edu

TSG 13: Teaching and Learning of Calculus

Aims

This Topic Study Group will seek contributions on the research and development in the teaching and learning of calculus, both at upper secondary and tertiary level. Contributions will account for advances, new trends, and important work done in recent years on the teaching and learning processes of Calculus.

Organization of the TSG 13

At ICME-12, the TSGs will have four one and a half hour timeslots at their disposal. This makes TSGs the prime forum for participation. On the website of ICME-12 it will be possible to follow the planning process and eventually access all relevant documents including the timetable for TSG sessions. Participants who would like to present papers in TSG 13 are requested to communicate with the team chairs. The TSG teams are responsible for establishing a scheme for paper presentation by distribution. Proposals for contributions should be put forward no later than November 30, 2011. If the proposal is accepted, the final draft should be submitted through on-line no later than April 10, 2012.

Guidelines for submission

The organizing team welcomes significant contributions related to the topics outlined here and to other related issues. Participants are requested to submit a paper not later than November 30, 2011 both via e-mails to the two team chairs and through the on-line submission system at the Congress Website. The length of the paper should be between 1500 and 2000 words.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 13 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Victor Martinez-Luaces(Uruguay) victoreml@gmail.com

Sunsook Noh(Korea) noh@ewha.ac.kr

Team Members: Margot Berger(South Africa) margot.berget@wits.ac.za

Francisco Cordero(Mexico) fcordero@cinvestav.mx

Greg Oates(New Zealand) g.oates@auckland.ac.nz

Liaison IPC Member: Johann Engelbrecht Johann.Engelbrecht@up.ac.za

TSG 14: Reasoning, Proof and Proving in Mathematics Education

Aims

The role and importance assigned to argumentation and proof in the last decade has led to an enormous variety of approaches to research in this area. Historical, epistemological and logical issues, related to the nature of mathematical argumentation and proof and their functions in mathematics, represent one focus of this wide-ranging research. Focus on mathematical aspects, concerning the didactical transposition of mathematical proof patterns into classrooms, is another established approach, which sometimes makes use of empirical research. Most empirical research focuses on cognitive aspects, concerning students' processes of production of conjectures and construction of proofs. Other research addresses implications for the design of curricula, sometimes based on the analysis of students' thinking in arguing and proving and concerns about didactical transposition. Recent empirical research has looked at proof teaching in classroom contexts and considered implications for the curriculum. The social-cultural aspects revealed in these studies motivate a current branch of research which is offering new insights. Comparative studies, trying to come to a better understanding of cultural differences in student's arguing and in the teaching of proof can be seen as part of this new branch of research. In this respect, papers presented at ICMI study 19 on "Argumentation and Proof" illustrate this diversity.

Differences concern the focus researchers take in their approach, as well in the methodological choices they make. This leads not only to different perspectives, but also to different terminology when we are talking about phenomena. Differences are not always immediately clear, as we sometimes use the same words but assign different meanings to them. On the other hand, different categories that we build from empirical research in order to describe students' processes, understandings and needs are rarely discussed conceptually across the research field. Conceptual and terminological work is helpful in that it allows us to progress as a community operating with a wide range of research approaches.

Guidelines for submission

The work of TSG 14 will serve a dual role: presentation of the current state of the art in the topic "Reasoning, proof and proving in mathematics education (RPP)" and expositions of outstanding recent contributions to it. The topic will be considered at all levels of education: elementary, secondary, university (including pre-service teacher education), and in-service teacher education. The Organizing Team of the Study Group invites theoretical, empirical or developmental papers that address one or more of the following themes (though any paper of relevance to the overall focus of the Study Group will be considered).

1. Historical / Epistemological /logical issues:

- The role of RPP in the history of mathematics.
- The role of logic in RPP

2. Curriculum and textbook aspect:

- The status of RPP at school, at different grade levels, and in various countries
- International comparison of the above status of RPP among countries

- Discussion of the mathematical contexts and developmental progression of RPP in curriculum and textbooks
- 3. Cognitive aspect:
 - Students' and teachers' views or conceptions of RPP
 - Students' main difficulties in learning RPP
 - Description and interpretation of students' behaviors in RPP tasks
- 4. Teaching and teacher education aspect:
 - Approaches to the teaching of RPP, at different grade levels, and in various mathematical subject areas
 - Pedagogical content knowledge teachers need for effective teaching of RPP
 - Preparation of teachers for effective teaching of RPP
 - Design of appropriate instructional interventions to help students overcome their difficulties in coping with RPP tasks
 - The role of dynamic software in the teaching and learning of RPP

Interested participants are requested to submit proposals for a paper not later than November 30, 2011 both via e-mail to the Team co-chairs and through the on-line submission system at the Congress Website. The proposals should be up to 2000 words in length (excluding references, tables, figures, and an abstract of up to 120 words). The final papers to be presented at the conference may be longer than this.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 14 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final paper and description of programme items

Organizers

Co-chairs: Maria Alessandra Mariotti (Italy) mariaalessandra.mariotti@unisi.it

Stephane Cyr (Canada) cyr.stephane@uqam.ca

Team members: Andreas Stylianides (UK) as899@cam.ac.uk

Viviane Durand-Guerrier (France) vdurand@math.univ-montp2.fr

Youngmee Koh (Korea) ymkoh@suwon.ac.kr

Kirsti Hemmi (Sweden) kirsti.hemmi@mdh.se

Liaison IPC member: Hee Chan Lew hclew@knue.ac.kr

TSG 15: Mathematical Problem Solving

Aims

Mathematical problem solving (MPS) is a field of study with a long history and has supported numerous research programs in mathematics education at all levels. Given the importance of MPS, the orientations and structure of many curriculum proposals and teaching models throughout the world have been either directly or indirectly influenced by it. However, the variety of problem solving programs with different agendas and practical implications makes it necessary to revise and reflect on their common foundations, nature, and historical development, and to build up and implement problem solving approaches to support and foster students' learning, and the development of mathematical knowledge and competencies.

In addition, the availability and use of digital tools in both real world and school environments require that researchers and practitioners review, analyze, and discuss the ways in which the tools could help students enhance and build up their mathematical knowledge. Thus, all the participants in the academic activities of the Topic Study Group will have an opportunity to reflect on and discuss issues and themes that address the relevance, research programs and results, current trends and agendas, and developments in MPS. The initial list of themes to frame and structure the sessions is presented here:

1. Origin, a historical overview, and characterization of mathematical Problem Solving.

The aim of this section is to document and reflect on the roots and evolution processes of the MPS from philosophical,

psychological, social, and cultural perspectives. The systematic discussion of these aspects will help us characterize and distinguish the rationale to think of and to relate problem solving approaches to the processes of comprehending and constructing the mathematics knowledge of students. As well, the discussion provides us with an opportunity to talk about the nature and characteristics of conflicting and controversial terms such as problem, assessment, and routine and non-routine tasks.

2. Foundations and nature of mathematical problem solving.

The purpose is to identify and discuss principles or tenets that explain problem solvers' cognitive behaviours to justify the development and construction of mathematics knowledge in terms of problem solving activities.

3. Problem solving frameworks.

The aim is to carefully review the extant frameworks that are currently used to structure and support research and curriculum reforms in MPS. In particular, the focus will be on discussing the extent to which these frameworks either explain students' mathematical problem solving behaviours, or serve as tools to explain why and how students construct new mathematical knowledge. In addition, it will be fruitful for furthering the field by making clearer distinctions among the existing frameworks in terms of their particular characteristics.

4. Research programs in mathematical problem solving.

The aim is to identify and revise ways in which research programs have contributed to the development of the field within many different contexts and research traditions. In particular, a discussion on how research findings in MPS are disseminated and used in different education systems.

5. Curriculum proposals.

The purpose is to discuss the distinguishing features of a mathematics curriculum that is structured around various problem-solving approaches. In particular, to identify and examine feasible ways to clearly relate problem-solving principles to the organization and structure of mathematical contents, processes and habits of mathematics practices. In addition, to address ways in which MPS could be integrated across curricula.

6. The influence of social and cultural perspectives on problem solving approaches.

The purpose is to discuss and document the extent to which social and cultural perspectives shape the ways of conceiving and implementing various problem-solving approaches.

7. Problem solving assessment.

The purpose is to identify and discuss different ways of assessing students' problem solving performances. In particular, to discuss the extent to which international studies such as TIMSS and PISA assess students' problem-solving processes and competencies. Furthermore, it will be important to discuss the effect of promoting mathematical competitions and in specific, mathematics Olympiads to enhance students' problem solving approaches.

8. Problem solving and the use of digital tools (internet, computer software, hand-held calculators, Ipads, etc.).

The purpose of this section is to analyse the different ways of reasoning that students might construct as a result of using systematically such tools. For example, to analyze the extent to which the use of the tools enhances heuristics and representations used in paper and pencil environments.

9. Problem solving outside schools.

It is recognized that a variety of activities with which students are engaged outside the school environment could play an important role in their mathematics learning. Thus, it is important to identify and discuss different ways in which students can participate in out-of school problem-solving activities that involve realistic and complex tasks.

10. The role of problem solving in teacher education (both pre-service and in-service).

The aim is to discuss the ways in which, pre-service and in-service teachers could develop their mathematical and didactic knowledge for teaching via problem solving approaches.

11. Problem solving and university / tertiary education.

In this section, we will address themes related to the use of problem-solving approaches to study the content of university mathematics. In particular, the role of problem solving in grasping big ideas such as infinity and proofs.

12. Future directions and advances.

The purpose is to identify future trends and directions in research, curriculum developments, and teaching of mathematical problem solving as a field of study.

Guidelines for submission

We invite the mathematics education community to submit proposals addressing the themes listed above and others related issues. The proposal should be around 8 pages and should be sent by October 31, 2011 both via email to the group co-chairs and through the on-line submission system at the Congress Website. The members of the organizing

group will review each proposal. The results and comments will be sent by January 15, 2012. And, the final version of the contribution should be sent by April 10, 2012. Any question that you might have, please send an email to any member of the group.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 15 website in the Congress Homepage.

Organizers

Co-chairs: Zahra Gooya(Iran) zahra.gooya@yahoo.com

Manuel Santos Trigo(Mexico) msantos@cinvestav.mx

Team Members: Man Goo Park(Korea) mpark29@snue.ac.kr

Chunlian Jiang(China) cljiang@umac.mo

Dindyal Jaguthsing(Singapore) jaguthsing.dindyal@nie.edu.sg

Liaison IPC Member: Yuriko Baldin yuriko@dm.ufscar.br or yuriko.baldin@uol.com.br

TSG 16: Visualization in the Teaching and Learning of Mathematics

Aims

The aim of TSG 16 at ICME-12 is to gather educators -educational researchers, instructional material developers, designers of technological learning environments, mathematics teachers and teacher educators -for the exchange of ideas related to visualization being a critical aspect of mathematical understanding.

We view technology as inspiring and driving visualization in mathematics education. Thus, research and development regarding innovations with technology that allow us to visualize things that in the past have not been easy to visualize, will be a major theme of the group.

The focal topics will include:

1. Semiotics and the significance of signs

From images to diagrams and graphs: Epistemological questions and classroom interactions related to the use of semiotics and the significance of signs in learning mathematics related to:

- classroom interaction using visible signs
- transformations between (visible) sign systems
- semiotic perspectives within mathematics teacher education
- production of meaning when learning mathematics with visual signs
- inventing and generalizing with visual signs

2. Visualization being the focus of innovative Learning & Teaching materials

Digital mathematics textbooks are now turning to be a major channel for visual engagement and interaction. Instructional materials integrate interactive diagrams, interactive visual examples and visual demonstrations. Animations are used in service of learning to teach math and new modes of visual communication are being implemented in Mobile Learning. In an attempt to understand the challenges driven by the above and other similar examples our discussion will look at issues such as:

- Innovative visualization tools for teaching
- Design of activities and tasks that are based on interactive visual examples
- Patterns of reading, using and solving with interactive linked multiple representations
- Roles of Diagrams, animations and video as instructional tools with new technologies

3. Visualization as understood by Cognitive & Neuro-cognitive studies

Mathematics education research is recently implementing quantitative and qualitative methods of educational Neuroscience. We will focus on:

- methods that link mathematics education research with neuro-cognitive studies
- brain topography associated with visual mathematical thinking
- neuro-cognitive studies related to the transition between visual and symbolic representations and its didactic implications

Guidelines for submission

The organizing team welcomes significant contributions related to the topics outlined here and to other related issues. Participants are requested to submit a paper not later than November 30, 2011 both via e-mails to the two team chairs and through the on-line submission system at the Congress Website. The length of contributions should be between 1500 and 2000 words in length.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 16 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Gert Kadunz(Austria) gert.kadunz@uni-klu.ac.at

Michal Yerushalmy(Israel) michalyr@construct.haifa.ac.il

Team Members: Mathias Hattermann(Germany) mathias.hattermann@uni-bielefeld.de

Michael Hoffmann(United States) meh@usna.edu

Kyoko Kakihana(Japan) kakihana@tsukuba-g.ac.jp, pxm03664@nifty.ne.jp

Jaehong Shin(Korea) jhshin@knue.ac.kr

Liaison IPC Member: Bernard Hodgson bhodgson@mat.ulaval.ca

TSG 17: Mathematical Applications and Modelling in the Teaching and Learning of Mathematics

Aims

Applications and modelling has been an important theme in mathematics education during the last 40 years. In particular, firstly the ICMEs with their regular working or topic groups and lectures on applications and modelling, and secondly the series of ICTMAs which have been held biennially since 1983. Their Proceedings and Survey Lectures indicate the state-of-the-art at the relevant time and contain many examples, studies, conceptual contributions and resources addressing the relation between the real world and mathematics. Further, in the current OECD Study PISA, relations between the real world and mathematics are also particularly topical. This Topics Study Group on "Mathematical applications and Modelling in the teaching and learning of mathematics" takes into account the above-mentioned reasons for the importance of relations between mathematics and the real world as well as the contemporary state of the educational debate, of research and development in this field. All the participants will have an opportunity to reflect on and discuss issues and themes concerned with goals and curriculum, teaching material and technology use, experimental research, pedagogy of modeling, assessment and obstacles and teacher education.

Guidelines for submission

We invite the mathematics education community to submit proposals addressing the themes listed below and other related issues.

1. Goals and Curriculum

- What is the actual role of applications and modelling in curricula in different countries?
- Is it possible? or desirable? to identify a core curriculum in applications and modeling within the general mathematical curriculum?
- Which applications, models and modelling processes should be included in the curriculum? Does the answer depend on each teacher or should there be some minimal indications in national and state curricula?
- When applications and modelling are included at different places in mathematics curricula, how can it be guaranteed that basic modeling skills and competencies are acquired systematically and coherently?
- What is the appropriate balance between modeling and pure mathematics in mathematics curriculum?

2. Teaching Material and Technology Use

- What authentic applications and modeling materials are available worldwide?
- Taking account of teaching objectives and students' personal situations (e.g., experience, competence), how can teachers set up authentic applications and modeling tasks?
- In which cases is technology crucial in modeling in the classroom?
- How is the culture of the classroom influenced by the presence of technological devices?

3. Experimental Research

- How does the authenticity of problems and materials effect students' ability to transfer acquired knowledge and competencies to other contexts and situations?
- What are the characteristic differences between expert modelers and novice modelers? What are characteristic features of the activity of students who have little experience of modeling?
- What are common features, and what are differences between students' individual ability and ability to work on applications and modeling in groups?

4. Pedagogy of Modeling

- How does the pedagogy of applications and modeling intersect with the pedagogy of pure mathematics?
- What are appropriate pedagogical principles and strategies for the development of applications and modeling courses and their teaching? Are there different principles and strategies for different educational levels?
- What are the areas of greatest need in supporting the design and implementation of courses with an applications and modeling focus?

5. Assessment

- What are the possibilities or obstacles when assessing mathematical modeling as a process (instead of a product)?
- When mathematical modeling is introduced into traditional courses at school or university, how should assessment procedures be adapted?
- When centralized testing of students is implemented, how do we ensure that mathematical modeling is assessed validly?

6. Obstacles and Teacher Education

- What obstacles/enablers appear to inhibit/facilitate changes in classroom culture (e.g., the introduction of group work in applications and modeling)?
- What are the major impediments and obstacles that have existed to prevent the introduction of applications and mathematical modeling, and how can these be changed?
- In teacher education, what techniques can be used to assess a future teacher's ability to teach and assess mathematical modeling?

Deadlines

November 30, 2011 Proposal submission

The proposal should be in English and around 8 pages (Times New Roman, 12 point, single spaced including Title, Name(s) and email(s) of the authors, institutions(s), country, abstract, main text, and references all in APA style) and should be sent for peer review both via email to both co-chairs and through the on-line submission system at the Congress Website. Submitted proposals will be acknowledged.

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final version

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 17 website in the Congress Homepage.

Organizers

Co-chairs: Jill Brown jill.brown@acu.edu.au

Toshikazu Ikeda ikeda@ed.ynu.ac.jp

Team Members: Sungsook Kim(Korea) sskim@pcu.ac.kr

Nicholas Mousoulides n.mousoulides.ucy.ac.cy

Jussara de Loiola Araujo jussara@mat.ufmg.br

Liason Member: Morten Blomhoej blomhoej@ruc.dk

TSG18: Analysis of Uses of Technology in the Teaching of Mathematics

Aims

This Topic Study Group aims to provide a forum to discuss the current state of art of the presence of technology in diverse aspects of teaching mathematics conveying a deep analysis of its implications to the future. The technology is understood in a broad sense, encompassing the computers of all types including the hand-held technology, the software of all types, and the technology of communication that includes the electronic board and the Internet. The discussions will serve as the opportunity for all interested in the use of technology in education environment, to understand its diverse aspects and to share the creative and outstanding contributions, with critical analysis of the different uses. To organize the discussions, the themes will focus on the use of technology in the classroom practice, the use of Internet and the distance education. The issues that will be addressed on these themes will comprise the following aspects: - the use of technology to teach, and the issues on the preparation of teachers to be competent in this; - the integration of technology in the school environment that includes the distance education; the progress of technology and the advances on the educational design of technology in the teaching environment.

Guidelines for submission

We invite submissions as either abstracts or full papers. Submissions could fall into (but are not limited to) the following themes:

- The use of technology in the classroom practice
- Design and use of digital teaching materials
- Teacher education
- The use of Internet and learning management systems
- Distance education

We endorse the submission of research reports and theoretical contributions. Furthermore we endorse the submission of innovative designs as long as the presentation includes theoretical or empirical perspectives showing potentials and pitfalls in the design. and all submissions should be sent in electronic form via the on-line submission system at the Congress Website. Please refer to the TSG18 web page (http://mathandtech.org/ICME12_TSG18/) for further instructions.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 18 website in the Congress Homepage.

Deadlines

November 30, 2011 Deadline of submission of all Abstracts (maximum of 500 words) or Full Proposal (maximum of 10 pages)

January 15, 2012 Notification of acceptance of Abstracts or Full proposal

April 10, 2012 Submission of final draft of all scientific activities to IPC

Organizers

Co-chairs: Morten Misfeldt(Denmark) mmi@dpu.dk

Wei-Chi Yang(USA) wyang@radford.edu

Team Members: Erol Karakirik(Turkey) karakirik@gmail.com

Ngan Hoe Lee(Singapore) nganhoe.lee@nie.edu.sg

Cheong Soo Cho(Korea) chocs@yu.ac.kr

Anders Sanne anders.sanne@plu.ntnu.no

Liaison IPC Member: Yuriko Baldin yuriko@dm.ufscar.br, yuriko.baldin@uol.com.br

TSG 19: Analysis of Uses of Technology in the Learning of Mathematics

Aims

In ICME12, the role of technology in mathematics education will be divided into two distinct study groups: Analysis of uses of technology in the teaching (TSG 18) and learning (TSG 19) of mathematics. Of course there is an interrelationship between these two aspects mathematics education, but we try to concentrate in TSG 19 on the aspect of LEARNING with ICT.

Topic Study Group 19 aims to bring together researchers, developers, and teachers who investigate and develop

theoretical accounts and empirically grounded contributions to the learning of mathematics with the use of technology. The organizing team is calling for papers for TSG 19. We invite papers that especially address one or more of the following issues in the teaching and learning of mathematics.

1. Issues related to the design of digital technology

The challenge of enhancing mathematics learning through the thoughtful design of digital software will be an important goal for both developers and teachers. We are interested in both prospective design ideas and principles as well as empirical investigations and evaluations aimed at developing a deeper understanding of mathematical concepts in digital learning environments.

2. Issues related to the design of learning environments

ICT has to be integrated into an environment that fosters learning. What environmental factors are conducive to supporting mathematics learning in the classroom, including independent individual, partner and group learning settings? How does the design of ICT learning environments need to consider - beside the ICT and the learner - the mathematics content, the cognitive impact, the educational and social situation and its relation to traditional media?

3. Issues related to large-scale and long-standing digital technology implementation projects

Most of the existing research base consists of short-term empirical investigations - there is a lack of large-scale and/or longitudinal digital technology implementation projects. It is important for a greater acceptance of ICT to see technology in the context of an extended mathematical learning environment (classroom, home, digital learning environments) and to document more precisely the benefits and the obstacles to learning mathematics with ICT in different settings.

4. Issues related to assessing mathematics learning with and through Digital Technologies

A related issue critical to the acceptance of new technologies in classrooms is the question of their role and use in summative and formative assessment of mathematics learning. We are interested in both possibilities and difficulties in using ICT in examination settings. New technological developments suggest assessment alternatives to the traditional, dominant mode of timed paper-and-pencil tests, e.g. computer aided assessment (CAA) of mathematics and automatic assessment of students' answers. In particular, in what ways can the Internet be incorporated in classrooms and in exams? Although experience in research concerning computer aided assessment dates back to the (intelligent) tutoring systems of the 1970s and 1980s, the complexity of the problem has allowed only limited progress. How can digital technologies aid in the formative assessment of student learning in ways that can guide instruction?

5. Issues related to the interaction between ICT and learners of mathematics

Cognitive processes are analysed in order to study how students learn mathematics. Researchers can infer on students' processes observing their interaction as community, including technological tool in this interaction. The elements that can be observed are speech, gesturing, action on the ICT, when students work face-to-face, but also at distance. These elements give information on the processes of understanding, constructing mathematical meanings, solving problems, conjecturing and proving. The information collected can be elaborated according to different cognitive frameworks.

6. Issues related to connectivity of ICT

"Connectivity" has been a key expression of the 17th ICMI-study. (Technological) connectivity stresses the point that ICT has to be seen in relation to many other aspects in learning situations. It includes oral and written communication through the Internet, learning environments and classroom activities, the relation of ICT to the mathematics content, to the work in the class room, to teachers, the administration and to the parents.

7. Issues related to theoretical and empirical models for learning with ICT

In the last few years several competence models have been developed, especially in the frameworks of international studies like TIMSS or PISA. Theoretical and empirical models for learning with ICT are necessary to both evaluate attainment of desired learning outcomes as well as identify specific deficits of learning. These models can provide a more sound basis to develop strategies for diagnostic feedback and for the construction of tasks for formative assessment.

8. Issues related to the implementation of Curricula

Despite of the use of digital technologies in the public and business world, and despite the tremendous number of research and practical classroom papers, the use of technologies in mathematics education and the impact on a change of curricula is still limited. We are interested in examples, strategies, experiences and critical considerations of the implementation of ICT into mathematics curricula or the curricular changes due to the implementation of government policies geared to ensure the ICT access at schools. Especially we are interested on aspects according to socio-economic, gender and cultural factors.

Guidelines for submission

1. Indicate name(s) of the author(s) and their location (town and country, school or establishment) and contact details.
2. Write a paper of about 8 pages (14 pt, single spaced, Times New Roman) including references. The paper should describe the context of the study, methodology used, and description of analysis of data and discuss the major findings.
3. Submit by November 30, 2011 both via e-mails to the Co-Chairs of TSG 19 and through the on-line submission system at the Congress Website.
4. Depending on the number of papers accepted we will decide on the format of presentation. It is possible, considering previous experience, that a paper will be commented on by a colleague, instead of formally presented by authors.

On-line submission

Go to<My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 19 website in the Congress Homepage.

Organizers

Co-chairs: Hans-Georg Weigand(Germany) weigand@mathematik.uni-wuerzburg.de
Marcelo Borba(Brazil) mborba@rc.unesp.br

Team Members: Ornella Robutti(Italy) ornella.robutti@unito.it
Monica Villarreal(Argentina) mvilla@famaf.unc.edu.ar, evilla1963@yahoo.com.ar
Tom Dick(USA) tpdick@math.oregonstate.edu
Young kuk Jeon(Korea) ycjun@sunchon.ac.kr

Liaison IPC Member: Yuriko Baldin yuriko@dm.ufscar.br, yuriko.baldin@uol.com.br

TSG 20: The Role of History of Mathematics in Mathematics Education

Aims

The aim of TSG 20 is to provide a forum for participants to analyse issues related to the introduction of a historical dimension in mathematics education. The introduction of such a dimension involves three different areas: mathematics, history, and didactics (i.e. maths education). This TSG aims to find and elaborate on a harmonious, balanced and effective interrelationship among these three scientific areas in a way that is enlightening and fruitful in mathematics education. It is expected that participants will share their ideas and classroom experience in connection with the following main issues:

- Theoretical and/or conceptual frameworks for including history in mathematics education;
- The role of the history of mathematics in pre- and in-service teacher education;
- The role of the history of mathematics at school;
- Original sources in the classroom, and their educational effects; or
- Design and/or assessment of teaching/learning materials on using history in mathematics education.

Guidelines for submission

The first version of submissions can be a short proposal of at most 3 pages, clearly indicating the aims and the nature of the work, synthesizing its content and results; a short list of references is expected. The organizers of TSG 20 welcome proposals from both researchers and practitioners, and encourage contributions from all countries. Submissions are to be written in English, but the command of that language will not be a key element when assessing the papers.

The short proposals will be reviewed by the team organizers. The proposals should clearly be related to one of the five above-mentioned sub-themes, and display a reasonable degree of expertise in at least one of the two disciplines "history of mathematics" and "didactics of mathematics / mathematics education". At any rate, a well-grounded small-scale experience will be preferred to a mere display of zeal.

The accepted contributions will be presented either as oral presentations or as posters, in one of the four 1.5-hour timeslots of the TSG. Proposal should be submitted on-line through the Conference website and sent by e-mail to the two TSG chairpersons. Files in .pdf formats are accepted. For the oral presentations, a written text of at most 10 pages is expected. Guidelines should soon be available on the Conference website.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 20 website in the Congress Homepage.

Organizers

Co-chairs: Renaud Chorlay(France) renaud-chorlay@noos.fr

Wann-Sheng Horng(Taiwan) horng@math.ntnu.edu.tw

Team Members: Manfred Kronfellner(Austria) m.kronfellner@tuwien.ac.at

Kathy Clark(USA) kclark@fsu.edu

Abdellah El Idrissi(Morocco) a_elidrissi@hotmail.com

Hyewon Chang(Korea) hwchang@cue.ac.kr

Liaison IPC Member: Evelyne Barbin evelyne.barbin@wanadoo.fr

TSG 21: Research on Classroom Practice

Aims

This Topic Study Group aims to elevate people's understanding of the importance, specific nature, and challenges in research on classroom practice, to promote exchanges and collaborations in identifying and examining high-quality practices in classroom instruction across different education systems, and to enhance the quality of research and classroom practice. Although it has long been recognized that research on classroom practice is important, developing systematic research on classroom practice in school mathematics is a relatively new endeavor. In fact, this Topic Study Group is the second time in the ICME history to take a primary focus on classroom practice. As the quality of classroom instruction is a key to the improvement of students' mathematics learning, this Topic Study Group should be of great interest to those who care about finding ways for understanding, assessing, and improving the quality of classroom practice.

Focus and themes

The focus of TSG 21 is a discussion of research related to mathematics classroom practice. Classroom practice includes activities of learning and teaching processes located within the classroom as a system. A consideration of the mathematics classroom as a system requires the study of the interactions among the mathematical content to be taught and learned, the instructional practices of the teacher, and the work and experiences of the students. In the interaction processes, mathematical content is contextualized through situations, the teacher plays an important instructional role drawing on his/her knowledge, and the students involve themselves in the learning processes. It is important to understand through research the nature and extent of the interactions in the mathematics classroom, the complexity of the didactic system, the roles of the teacher and students in the interaction processes when the mathematical content is taught and learned, and the complexity of the activities in mathematics classrooms.

With this focus, TSG21 is intended to provide an international platform for all interested parties (e.g., mathematics educators, school teachers, educational researchers, etc.) to disseminate findings from their research on classroom practice with the use of various theoretical perspectives and methodologies, and to exchange ideas about mathematics classroom research, development, and evaluation.

Possible themes of TSG21 include the following:

1. Theoretical perspectives and research approaches in defining, identifying, assessing, and improving the quality of classroom practice;
2. Methodological advances in research on classroom practice, such as the use of video clips;
3. High-quality classroom practices that are identified, valued, and assessed in different education systems;
4. Various issues concerning research on classroom practice and possible (dis)connections between research and practice.

Guidelines for submission

The organizing team welcomes contributions to the themes outlined above as well as related issues. Participants are invited to submit 1500-2000 word (excluding references) proposals by November 30, 2011 both via e-mail to the team chairs and through the on-line submission system at the Congress Website. Your proposals should contain the following information:

- A cover page including "Proposal's title, Author name(s), Institution/School, Country, and Contact information (esp. e-mail address of the corresponding author)"
- Abstract
- Main text
- References

(Note: Identifications about proposal contributors should only appear on the proposal's cover page.)

Your proposal shall be submitted as PDF file attachment (using Times New Roman 12-point font size and single spacing). All submitted proposals will be peer reviewed. With a proposal submission, you will be invited to help review others' proposals. The members of the organizing team will also review each proposal, and the reviews with decisions will be returned by January 15, 2012. For accepted proposals, contributor(s) will be invited to submit a final paper by April 10, 2012. The guidelines for the preparation and submission of the final paper will be provided by January 15, 2012.

Further information about paper preparation, submission, presentation format and schedule, and activities during the Congress will be posted at the TSG21 website in the future. If you have any questions or suggestions, feel free to email any member of the organizing team.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 21 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission (1500-2000 words)

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final papers

Organizer

Co-chairs: Yeping Li(USA) yepingli@tamu.edu

Helia Oliveira(Portugal) hmoliveira@ie.ul.pt

Team members: Raimundo Olfos Ayarza(Chile) raimundo.olfos@ucv.cl

Merrilyn Goos(Australia) m.goos@uq.edu.au

Kwangho Lee(Korea) paransol@knue.ac.kr

Liaison member: Frederick Leung frederickleung@hku.hk

TSG 22: Learning and Cognition in Mathematics

Aims

Learning and cognition is a classical and very vital area in research on mathematics education. Researchers have published many valuable research findings that have contributed to significant development in this area. The continued efforts of researchers now and in the future will, we hope, lead to extensive 'pay-offs'. Different to many other special and related TSGs, such as teaching and learning of algebra, geometry, measurement, statistics, calculus, reasoning, proving and problem solving, to mention a few, TSG22's participants will contribute a more general focus on learning and cognitive activity, and insights into students' characteristics; their strengths and weaknesses in the process of mathematics learning. The TSG focus can include any teaching and learning contexts: from kindergarten to tertiary level, adult education, and teacher professional development. TSG22 discussions should be balanced between theories and their practical applications in mathematics teaching and learning.

Focus and themes

1. Psychological characteristics of students that influence their inclination to think creatively in mathematics
 - Effects of psychological characteristics on students' test performances
 - The role of optimism (resilience) in mathematical problem solving
2. Cognitive processing associated with the creative constructing of knowledge
 - What aspects of curriculum development (or curriculum materials) contribute to developing learners' mathematical thinking, mathematical inquiry or creativity in mathematics?
 - What cognitive processes are associated with autonomous student development of new knowledge and what

'teacher moves' can promote such activity?

3. Mathematical thinking accompanied by affective elements

- In what ways are cognitive, social, and affective elements connected during the development of new knowledge?
- The nature of affective elements that can accompany creative mathematical thinking.

4. Social interactions associated with creative mathematical thinking

- What aspects of teaching mathematics (teaching behaviors) contribute to developing mathematical thinking, mathematical inquiry or creativity in mathematics?
- What are the characteristics in classroom interaction or discourse (students-students; teacher-students) that facilitate or contribute towards knowing mathematics or developing thinking or inquiry abilities?
- What mathematical problems are there that have good use in the classroom by teachers that contribute towards developing cognition in mathematics?

5. The nature of mathematical understanding

- Children's interpretation of and performance on national and international math tests
- The rationale behind selecting a wrong answer in multiple choice items in mathematics assessments.
- Contexts for developing mathematical understanding

Guidelines for submission

The organizing team welcomes recent significant contributions to this Study Topic area. Prospective contributors are requested to submit a paper with the length between 1000 and 1500 words no later than November 30, 2011 both via e-mail to the two co-chairs and through the on-line submission system at the Congress Website. Interested participants are encouraged to e-mail to the co-chairs and access the TSG22 webpage when we begin to add contributions. The schedule for the work of the study group at ICME-12 will be announced later.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 22 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Hsin-Mei Huang (Taiwan) hhuang22@gmail.com

Gaye Williams (Australia) gaye.williams@deakin.edu.au

Team Members: Sungsun Park (Korea) starsun@cnu.ac.kr

Mariana Saiz (Mexico) msaiz@upn.mx

Jerry Becker (USA) jbecker@siu.edu

Liaison IPC Member: Shiqi Li sqli@math.ecnu.edu.cn

TSG 23: Mathematical Knowledge for Teaching at Primary Level

Aims

Many countries have experienced reforms in school mathematics curricula and/or in teaching policies over the past three decades. These have resulted in more demands on teachers than before in terms of their knowledge and skills in teaching mathematics. There has also been growing concern over the mathematical knowledge required for teaching mathematics in schools. Specifically, mathematics educators have sought to understand what mathematical knowledge teachers need to know as well as know how to use in teaching. Concerns about teacher knowledge emanate from both the increasing demands on mathematics teachers and the perceived lack of, or gaps in, knowledge that is observed in many teachers. This is a broad field and there has been substantial amount of research across countries and contexts. The TSG will provide opportunities to share experiences of researchers in their work, to interrogate the diverse outcomes of different research, and to understand the nature of mathematical knowledge for teaching. The main objective of the TSG is to examine what we know, what we do not know, and what we need to know or know more of - for us to understand the

mathematical knowledge for teaching at primary level. The TSG will focus on primary level mathematics and will invite researchers that have researched, or are interested, in primary school mathematics teaching.

Guidelines for submission

The organizing team welcomes recent significant contributions to this Study Topic area. Prospective contributors are requested to submit a paper with the length between 1000 and 1500 words no later than November 30, 2011 both via e-mails to the two co-chairs and through the on-line submission system at the Congress website. Interested participants are encouraged to e-mail to the co-chairs and access the TSG 23 webpage when we begin to add contributions.

The schedule for the work of the study group at ICME-12 can be derived from congress website (scientific programs -> congress timetable). It consists of four 90 minute time slots on Tue, Wed, Fri and Sat morning.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 23 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Christoph Selter(Germany) christoph.selter@t-online.de

Suck Yoon Paik(Korea) sypaik@snue.ac.kr

Team Members: Catherine Taveau(France) catherine.taveau@paris.iufm.fr

Pi-Jen Lin(Taiwan) linpj@mail.nhcue.edu.tw

Len Sparrow(Australia) l.sparrow@curtin.edu.au

Liaison IPC Member: Mercy Kazima(Malawi) mkazima@chanco.unima.mw

TSG 24: Mathematical Knowledge for Teaching at the Secondary Level

Aims

Many countries have experienced reforms in school mathematics curricula and/or in teaching policies over the past three decades. These have resulted in more demands on teachers than before in terms of their knowledge and skills in teaching mathematics. There has also been growing concern over the mathematical knowledge required for teaching mathematics in schools. Specifically, mathematics educators have sought to understand what mathematical knowledge teachers need to know as well as know how to use in teaching. Concerns about teacher knowledge emanate from both the increasing demands on mathematics teachers and the perceived lack of, or gaps in, knowledge that is observed in many teachers.

In TSG 27 at ICME11--Mathematical Knowledge for Teaching, it had been investigated about what mathematics primary and secondary teachers know and use, as well as what they need to know and know how to use. In ICME 12, this topic will be revisited in both TSG 23 and TSG 24. Specifically, TSG 23 focuses on the primary level, and TSG 24 focuses on the secondary level.

TSG 24 at ICME-12 aims to gather mathematicians, mathematics teachers, teacher educators and other congress participants to especially examine current scholarship and research on mathematical knowledge for teaching at the secondary level by collecting, comparing and discussing research experiences in this area. And it is expected to address the following questions:

- What mathematical knowledge is needed for teaching at secondary level?
- What is the status of secondary level mathematics teachers' mathematical knowledge for teaching and how do they make use of it in their teaching practices?
- How should we move forward (or what we have done) towards better preparing prospective and in-service teachers with mathematical knowledge for teaching at secondary level?

Focus and themes

The focal topics will include but not be limited to:

1. Theoretical perspectives or conceptual frameworks for mathematical knowledge for teaching at secondary level, e.g., what mathematical knowledge a secondary teacher needs to know and know how to use it? What are the approaches, from the practice point of view, that could support teachers developing their mathematical knowledge that they need to know and know how to use it? What are the nature and its structure of mathematical knowledge for teaching?
2. Empirical researches that will contribute to our understanding of what mathematical knowledge is needed or how it is assessed in different scenarios, e.g., teachers' mathematical knowledge for teaching in specific activities, such as analyzing students' mathematical thinking, analyzing students' mathematical errors, instructional design, etc; teachers' mathematical knowledge for teaching in specific domains, such as algebra, geometry, statistics, etc; teachers' mathematical knowledge for teaching in special situations, such as information and communication technology environment, students who have special needs, etc; the innovative and creative approaches of developing mathematical knowledge for teaching and the instruments for assessing these approaches specifically.
3. Empirical researches to explore relationships between teachers' learning of teaching (both pre-service and in-service) and students' learning of mathematics, e.g., the effect of mathematical knowledge for teaching on student achievement, the innovative and creative approaches of developing the effect of mathematical knowledge for teaching on students' learning and achievement.
4. Empirical researches to explore the various factors which lead to commonalities or differences of mathematical knowledge for teaching in different countries, regions, and individuals, e.g., cultural factors, mathematics teacher licensure policy, etc.

Guidelines for submission

TSG 24 will meet for four sessions of 1.5 hours each. The organization of this time will depend upon the proposals submitted. The organizing team welcomes any recent contributions to the topics outlined here and to other related issues. Prospective contributors are requested to submit a paper with the length between 1500 and 2500 words no later than November 30, 2011 both via e-mails to the two co-chairs and through the on-line submission system at the Congress Website. Interested participants are encouraged to e-mail to the two co-chairs.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 24 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final version

Organizing Team

Co-chairs: Aihui Peng(China) aihuipeng@gmail.com, huihuiai0@163.com

Hikma Smida(Tunisia) Hikma.Smida@ipest.rnu.tn

Team Members: Hakan Sollervall(Sweden) hakan.sollervall@lnu.se

Dongwon Kim(Korea) pourpeda@kofac.or.kr

Karin Brodie(South Africa) karin.Brodie@wits.ac.za

Liaison IPC Member: Mercy Kazima(Malawi) mkazima@chanco.unima.mw

TSG 25: In-service Education, Professional Development of Mathematics Teachers

Aims

The aim of TSG 25 at ICME-12 is to discuss the experiences and approaches developed in different countries to support the professional development of teachers for practice, in practice and from practice. The professionalization of teaching requires teachers and teacher educators to be involved in a learning process throughout their entire professional life. The complexity of mathematical teaching practices raises a lot of questions for in-service teacher education such as the demands of new curricula, the development of interdisciplinary projects, the introduction of new technologies into classrooms, or the adaptation of teaching practices for different students and contexts (students with learning difficulties, multicultural classrooms, underprivileged schools, adults, analphabetism etc.). These challenges demand serious

reflections as to how to support the persons directly concerned by these issues (practicing teachers and other school practitioners) and develop means that take into account the differing problems to educate teachers in each country. The study group will discuss state-of-the-art approaches to the in-service education and professional development of teachers from a multi-national perspective.

Guidelines for submission

We welcome submissions of project reports and research articles addressing the following topics:

- Approaches in developing expertise in effective mathematics teaching
- The challenges, contents, and forms of effective in-service education and professional development
- Empirical studies on teacher change through in-service education or professional development and evaluation of professional development
- Promising programs and projects focusing on the in-service education and professional development of mathematics teacher leaders
- Further topics

1. All proposals should be in English and should have the following content: Title of the proposal, name(s) and e-mail address of the author(s), institution(s), country, abstract (max. 10 lines), main text, and references.
2. Submission can be a project report or a research report, including: abstract, theoretical or conceptual framework, methodology, results, and discussion and conclusion.
3. The length of the proposal should be no longer than 3000 words, 1.5 spaced, 12 pt, Times New Roman, references shall follow APA style.
4. Proposals should be submitted electronically by November 30, 2011 both via e-mails to the Co-chairs of TSG 25 and through the on-line submission system at the Congress website.
5. Submitted proposals will be acknowledged upon reception. Based on the received proposals the Organizing Team of TSG 25 will develop the program for the TSG's sessions at ICME 12.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 25 website in the Congress Homepage.

Deadlines

November 30, 2011 Submission of brief proposals (two pages) or full proposal (no longer than 3000 words)

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final paper and description of programme items

Organizers

Co-chairs: Shuha An(USA) san@csulb.edu

Andrea Peter-Koop(Germany) andrea.peter-koop@uni-bielefeld.de

Team Members: Yimin Cao(China) caoyim@bnu.edu.cn

Barbara Clarke(Australia) Barbara.Clarke@monash.edu

Gooyeon Kim (Korea) gokim@sogang.ac.kr

Agatha Lebethe(South Africa) agatha@mepp.co.za

Liaison IPC Member: Gabriele Kaiser gabriele.kaiser@uni-hamburg.de

TSG 26: Pre-service Mathematical Education of Teachers

Aims

The topic study group on pre-service mathematical education of teachers is dedicated to sharing and discussing of significant new trends and development in research and practice about the various kinds of education of pre-service mathematics teachers and of pre-service primary teachers who teach mathematics and are trained as generalists. It aims to provide both an overview of the current state-of-the-art as well as outstanding recent research reports from an international perspective. The group will discuss research experiences with different practices of pre-service mathematical education of (mathematics) teachers throughout the world, i.e. similarities and differences concerning the formal

mathematical education of teachers, types and routes of teacher education, curricula of (mathematics) teacher education, facets of knowledge and differences in their achievements and beliefs about the nature of their training, and a variety of factors that influence these differences.

Outline

TSG 26 will collect, compare and discuss research experiences with different practices of pre-service mathematical education of teachers throughout the world. It is important to discuss the similarities and differences of the educational routes of such education and its way of certification or licensure examination for teachers all over the world as well as a variety of factors that influence the number and the type of teaching adaptations created by pre-service teacher educators. Being aware of the possible ambiguity of the name of the topic, we define the topic of this TSG to cover activities that take place during the mathematical education and training of future (mathematics) teachers either at universities or special institutions.

Scope of the Topic Study Group

TSG 26 is dedicated to sharing and discussing of significant new trends and development in research and practice about the mathematical education and training of pre-service teachers. It aims to provide both an overview of the current state-of-the-art as well as outstanding recent research reports and promising practices from an international perspective.

In order to provide a preliminary orientation to the field of study, some distinctions might be drawn. Above all, there seems to be substantial differences between the mathematical education of elementary and secondary mathematics teachers. Other differences relate to forms and sites, to contents and methods, and to agents and aims:

- **Organizational forms:** Organization of mathematics and mathematics education as consecutive or integrated (or concurrent) components of the pre-service education of mathematics teachers.
- **Sites:** Traditional universities, teacher universities, teacher education colleges or in-school-education as the providers of the mathematical education of teachers.
- **Contents:** What kind of mathematics is taught and learned? What kind of pedagogical content knowledge or mathematics didactical knowledge is taught and learned? How is the integration with pedagogical knowledge structured? Is the focus on academic mathematics or school mathematics, does it comprise mathematics from a higher standpoint including historical, epistemological, philosophical, and sociological knowledge of mathematics? What are the differences between primary and secondary levels concerning these aspects?
- **Students:** Who are attracted and enrolled by teacher education programs? How does mathematical teacher education take these differences into account?
- **Instruction methods:** Role of self-regulated student study groups in contrast to lecture work. Could we examine the epistemological complex of the pre-service teacher who is alternatively earliest pupil, university student and mathematics teacher? What kind of adaptation (projective, normative, avoiding or removing) could we see when preservice teachers are in a mathematic class and articulate mathematics knowledge and the needs of pupils?
- **Agents:** Who is in charge of the pre-service mathematical education of teacher? Mathematicians, experienced mathematics teachers, specialized mathematics teacher educators or didacticians. What are their views about different types and opportunities of learning offered to the future teachers within their respective expertise? What are the interactions between mentors and university teacher educators before, during and after field experience (teaching practice)? What are the impacts of field experience?
- **Aims:** The particular forms, sites, contents, instruction methods and agents may produce a cumulative effect on the future teachers. In many places, the pre-service education of secondary mathematics teachers shows the tendency to aim implicitly at forming the habits of a mathematician, and not of a mathematics teacher. Taking a long term perspective, what does research inform policymakers about the impacts of mathematics teacher training on the outcomes of the students of these future teachers? Since this is serious gap in research, participants are encouraged to suggest innovative research to create knowledge about this gap.

Focus of TSG26 and main research questions

The main focus of TSG 26 will be on empirical, as well as theoretical and developmental papers on issues such as:

1. A comparison of the educational programs of pre-service education of mathematics teachers or pre-service education of teachers teaching mathematics at primary level in different countries, including empirical studies on effectiveness of various teacher educational systems all over the world, with a special focus of East-West comparisons ;

2. The link or relationship between the various parts of the education programs such as mathematical knowledge, pedagogical content knowledge and pedagogical knowledge, the role of practical experiences in teacher education, for pre-service mathematical primary and secondary teachers and eventually the learning outcomes of their students ;
3. Detailed analysis of the kind of mathematics, that is necessary for pre-service teacher education, the role of elementary mathematics from an advanced standpoint, especially for primary future teachers ;
4. Innovative and creative approaches including training resources for a redesign of pre-service mathematics education (under educational/curriculum reforms in particular) existing at various parts of the world.

Call for papers

We welcome proposals that deal with all aspects of the above focus and innovative ideas that promote a better mathematical education for pre-service teachers.

We strongly encourage you to participate in the work of the group with a paper, which might be only discussed. If you want to participate, please send a text of 2000 words which presents the theoretical framework and the relationship to the main focus of TSG26, the methodology, results and possible conclusion. Please submit your text as attachment before November 30, 2011 both via e-mails to the co-chairs and through the on-line submission system at the Congress website.

The paper shall be submitted as a PDF file using Times New Roman 11-point font size and single-spacing. Please also include title, author(s), institution, email address at the beginning of the abstract.

TSG 26 will meet for four sessions of 1.5 hours each. The organization of the time slots will depend on the proposals submitted.

All proposed papers will be peer-reviewed. The decision of whether the paper will be accepted without or with presentation at the conference will be sent out by January 1, 2012. The final paper shall be submitted no later than April 1, 2012.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 26 website in the Congress Homepage.

Organizers

Co-chairs: Sylvie Coppe(France) sylvie.coppe@univ-lyon2.fr

Ngai-Ying Wong(Hong Kong) nywong@cuhk.edu.hk

Team Members: Lucie De Blois(Canada) lucie.deblois@fse.ulaval.ca

Bjoern Schwarz(Germany) schwarz@erzwiss.uni-hamburg.de

Insun Shin(Korea) shinis@knue.ac.kr

Khoon Yoong Wong(Singapore) khoonyoong.wong@nie.edu.sg

Liaison member: Gabriele Kaiser(Germany) gabriele.kaiser@uni-hamburg.de

TSG 27: Motivation, Beliefs and Attitudes towards Mathematics and its Teaching

Aims

In the tradition of Topic Study Groups on affect at previous ICME conferences, the Topic Study Group 27, "*Motivation, beliefs and attitudes towards mathematics and its teaching*," addresses researchers working in the field of affect in mathematics education. Affect has been a topic of interest in mathematics education research for more than thirty years. Today we know that affective variables can be seen as either hidden or explicit factors that influence learning outcomes as well as pedagogic practice. The different research perspectives used in the study of affect include psychological, social, philosophical, and linguistic, and we welcome all these and as well as other perspectives.

The constructs 'motivation', 'beliefs', and 'attitudes' should be interpreted in the broadest sense of the terms, and we thus invite discussion on all areas of affect, encompassing attitude, beliefs, emotion, goals, identity, motivation, needs, self-concept, and values, as they play a crucial role in mathematics learning and teaching.

The aims of TSG 27 at ICMI-12 are:

1. To address researchers working in the field of affect in mathematics education.
2. To generate discussion on motivation, beliefs, and attitudes in mathematics education, both at the student's and the teacher's level.

3. To present research results and reports on research activities that will allow the group to make an updated sketch of the state of the art, thus further developing the aims of the 27th ICMI Study, and addressing new trends and developments in research and practice in these areas.

We expect that participants will engage in the review process prior to the conference, and we will nominate respondents to all presentations in order to enable deeper levels of critical discussion during the conference.

Key words: affect, attitude, beliefs, emotion, goals, identity, motivation, needs, self-concept, values.

Guidelines for submission

The activities of the group during the conference will include selected lecture-type presentations, with most of the time spent in discussions around accepted papers. We invite research-based papers on affect in mathematics education. We encourage papers from researchers worldwide and are particularly interested in papers that relate theory to practice. Each participant is restricted to one speaking appearance.

1. Proposals should be in English and should have the following content: Title, Name(s) and e-mail addresses of the author(s), Institution, Country, Abstract (max 10 lines), Main text, References, and Appendices (optional).
2. The length of the paper is expected to be up to 8 pages (including references and appendices). For submissions, please use the same format as for PME 35 (e.g., A4 paper with margins set at 2.5 cm for top and bottom; 2 cm left and 2 cm right).
3. Proposals should be submitted electronically by November 30, 2011 both via e-mail to the Co-chairs of TSG 27 and through the on-line submission system at the Congress website.
4. Proposals received will be acknowledged upon reception. Based on the received proposals the Organizing Team of TSG 27 will compose the program.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 27 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Birgit Pepin(Norway) birgit.pepin@hist.no

Ji Won Son(USA) sonjiwon@utk.edu

Team Members: Bettina Roesken(Germany) Bettina.roesken@uni-due.de

Ines Gomez Chacon(Spain) igomezchacon@mat.ucm.es

Nayoung Kwon(Korea) rykwon@inha.ac.kr

Liaison IPC Member: Bill Barton b.barton@auckland.ac.nz, barton@math.auckland.ac.nz

TSG 28: Language and Communication in Mathematics Education

Aims

Language and communication are recognized to be core components in the teaching and learning of mathematics, but there are many outstanding questions about the nature of interrelationships among language, mathematics, and teaching and learning. As well as empirical studies, recent research has demonstrated the wide range of theoretical and methodological resources that can contribute to this area of study, including those drawing from cross-disciplinary perspectives influenced by, among others, sociology, psychology, linguistics, and semiotics.

This topic study group will allow participants to present and discuss the latest research in language and communication in mathematics education internationally. We consider language in its broadest sense to include all modes of communication and welcome contributions addressing visual and gestural as well as spoken and written modes.

Sub-themes within the topic include:

1. Relationships among language, mathematical thinking and the learning of mathematics
 - How does use of particular forms of language and other signs contribute to the development of mathematical

thinking?

- What inferences about mathematical thinking can be drawn from analysis of communicative activity?
- How do various languages represent mathematical concepts differently and how do the differences influence mathematical understanding?
- How does the relationship between language use and mathematical thinking change across human developmental stages?

2. Studying classroom interactions

- How do different forms of interaction affect mathematics learning?
- How can effective forms of interaction be developed in mathematics classrooms?
- What theoretical and methodological approaches are helpful for studying classroom interaction?
- How do differences between home and school language influence interaction in mathematical classroom?

3. Analysis of communicative activity in mathematics and mathematics education

- What insights are offered by the use of theoretical tools from linguistics, semiotics, discourse theory, sociology, etc.?
- How can the particular nature of mathematics be accounted for in analyses of language?
- How does mathematics education practice shape the appropriate use of theoretical tools for analyzing language and communication?
- How are language practices and communicative activities in mathematics education similar to or different from those in other subject areas?

4. Teaching and learning mathematics in bilingual and multilingual settings

- How is mathematical learning affected by multilingualism?
- What are the challenges faced and benefits experienced by teachers and learners of mathematics in bilingual and multilingual settings?
- What communicative strategies can support bilingual and multilingual learners of mathematics?
- How do differences between home and school language influence the learning of mathematics?
- How does the linguistic shaping of teaching mathematics affect the learning of mathematics in classrooms with linguistic and cultural plurality?

Guidelines for submission

Topic Study Group 28 (TSG 28) will meet for four sessions of 1.5 hours each. The organisation of this time will depend upon the proposals submitted. The organizing team invites submissions of proposals for oral presentations or posters relevant to the aims and focus described above. We anticipate that most contributions will address one or more of the sub-themes identified above. If you are in any doubt about whether your proposal may be suitable for this group, please contact a member of the organizing team.

The official language of the congress is English and proposals should be presented primarily in English. However, we recognize problems related to the presentation of analyses of linguistic data originally produced in other languages. We encourage participants to consider creative ways of communicating their data and analyses while maintaining authenticity and validity.

Proposals of 1000 - 1500 words should be submitted electronically by 1 November 2011 both through the online submission system at the ICME-12 official website and by email to the co-chairs of the TSG.

The submission system will open on the middle of September, 2011. Please indicate whether you wish to propose a poster or an oral presentation. If your proposal is accepted, you will be invited to prepare a paper of no more than 10 pages in the ICME-12 template to be submitted through the TSG 28 online submission system by 10 April 2012. The template can be found at the ICME-12 website.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 28 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of final version

Organizers

Co-chairs: Tracy Craig(South Africa) *Tracy.craig@uct.ac.za*

Candia Morgan(UK) *c.morgan@ioe.ac.uk*

Team Members: Marcus Schuette(Germany) *schuette@math.uni-frankfurt.de*

Rae Young Kim(Korea) *kimrae@ewha.ac.kr*

David Wangerd *wanger@unb.ca*

Liaison IPC Member: Oh Nam Kwon *onkwon@snu.ac.kr*

TSG 29: Gender and Mathematics Education

Aims

Topic Study Group 29 at ICME-12 hopes to bring together researchers and teachers of different countries who feel concerned by questions related to gender and mathematics education.

While mathematics is universal, it appears that delicate process in the classroom, but not only there, lead boys and girls to perceive things differently. Perceptions of mathematics formed at school have implications for students' future learning and careers. If the teacher, male or female, is conscious of gendered practices and attitudes, what can he/she do to provide to each pupil or student, boy or girl, the opportunity of understanding, participating and appreciating mathematics?

Here are some of the subjects that could be of great interest for participants in the topic study group.

1. Gender inequalities in participation, achievement and attitudes in particular countries as well as data from international comparative studies like TIMSS or PISA.
2. Cultural, economical, sociological, psychological, others factors that contribute to gender inequalities and inequities in mathematics.
3. Approaches to reduce gender inequities in classrooms, in schools, colleges or universities: research findings as well as institutional plans or individual experiments are welcome.
4. Sensitizing or training teachers to questions related to gender in mathematics education.
5. Others not listed before but of interest for the topic.

We especially invite participants from developing countries to present a contribution.

Guidelines for submission

1. Indicate name(s) of the author(s) and their location (town and country, school or institution) and contact details
2. The length of the proposal should be between 1000 and 1500 words.
3. Submit by November 30, 2011 both via e-mail to the co-chairs of TSG 29 and through the on-line submission system at the Congress website.

On-line submission

Go to<My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 29 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Olof Steinhorsdottir(USA) *olly.steintho@uni.edu*

Veronique Lizan(France) *veronique.lizan@math.univ-toulouse.fr*

Team Members: Collen Vale(Australia) *leen.Vale@vu.edu.au*

Laura Martignon(Germany) *martignon@ph-ludwigsburg.de*

Sun Hee Kim(Korea) *mathsun@silla.ac.kr*

Liaison IPC Member: Cheryl Praeger *cheryl.praeger@uwa.edu.au*

TSG 30: Mathematics Education in a Multilingual and Multicultural Environment

Aims

A Topic Study Group is designed to gather a group of congress participants who are interested in a particular topic in mathematics education. For ICME-12, the Topic Study Group is the major arena for participation.

The purpose of TSG 30 is to gather congress participants who are interested in research, development or teaching experiences that focus on mathematics education in multilingual, intercultural and/or multicultural situations. This TSG will include presentations and discussions of the state-of-this topic area and new trends and developments in research and practice in mathematics education in multicultural and/or multilingual environment. Contributions related to TSG 30 will be around issues and questions such as:

- What is distinctive about the learning and teaching of mathematics in multicultural and multilingual settings?
- How do curricula and policy take account (or not) of cultural and linguistic diversity?
- How do methods of assessment and evaluation take account of cultural and linguistic diversity?
- How does/should teacher education take account of cultural and linguistic diversity?
- What is the experience of education systems that have changed the medium of instruction in mathematics?
- What is the experience of education systems that use a former colonial language as the medium of instruction in mathematics?
- How does/should the teaching and learning of mathematics adapt to changes in cultural and linguistic diversity e.g. In the light of migration, political instability, etc.
- How can mathematics teaching respond to the oppression of cultural and linguistic minorities?
- How does mathematics teaching contribute to the oppression of cultural and linguistic minorities?
- What is distinctive about mathematics learning out of school in multicultural and multilingual settings?
- What theoretical perspectives on cultural and linguistic diversity are most helpful in investigating the teaching and learning of mathematics?

Presentations on the above issues and questions could include the following types of studies:

- Empirical proposals with an anthropological, sociological or educational focus.
- Theoretical proposals about multicultural, multilingual and/or intercultural education and its relation to mathematics.
- Descriptions and analyses of teaching experiences in multicultural and/or multilingual environments.
- Analysis and/or evaluation of syllabi or descriptions of relevant practices regarding the preparation of teachers working in multicultural and/or multilingual environments.
- Description and evaluation of educative resources that support intercultural and/or multilingual education (audio-visuals, manipulatives, computer programs, bibliographies, etc.)
- Bibliographic surveys related to the issues and questions above with analysis or critical comments.

Guidelines for submission

TSG 30 will meet for four sessions of 1.5 hours each. The structure and organization of these sessions will depend upon the proposals submitted.

The organizing team invites submissions of proposals for oral presentations or posters relevant to the aims and focus of TSG 30 as described above. We expect that most contributions will address one or more of the issues and questions identified above. The official language of the congress is English and proposals should be presented primarily in English. Further guidelines for submission are as follows:

- Brief proposals for papers and posters (1000 - 1200 words) should be submitted electronically by Nov 1, 2011 both through the TSG 30 online submission system at the ICME-12 official website and by email to the co-chairs of the TSG 30.
- Indicate whether your proposal is for a poster or an oral presentation. If your proposal is accepted, you will be invited to prepare a paper of no more than 8 pages in the ICME-12 template to be submitted through the TSG 30 online submission system by 10 April 2012. The template can be found at the ICME-12 website.
- Poster presentations will be allocated time for discussion.
- Time allocation and other details (parallel or not) about the oral presentations would be finalized depending on the number of proposals received.
- In case of queries and clarifications contact the two co-chairs.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 30 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Note

As one part of its program TSG 30 will include reports of the work of ICMI Study 21 entitled Mathematics Education and Language diversity (see <http://www.icmi-21.co.za/>)

Organizers

Co-chairs: Anjum Halai(Pakistan) anjum.halai@aku.edu

Clement Dlamini(Swaziland) dlamini.c@examscouncil.org.sz

Team Members: Richard Barwell(Canada) Richard.Barwell@uottawa.ca

Nancy Chitera(Malawi) nchitera@yahoo.com

Dong Joong Kim(Korea) Dong-Joong.Kim@indstate.edu

Liaison IPC Member: Frederick Leung frederickleung@hku.hk, hrslks@hku.hk

TSG 31: Task Design and Analysis

Aims

A critical topic in mathematics education is the design and analysis of open-ended, realistic, and exemplary tasks. Task design and analysis is a relatively new field, appearing for the first time as a topic of study (TSG 34) at ICME-11 in Monterrey, Mexico. It is developing quickly and dynamically as an area of international attention and active research.

Topic Study Group 31 will bring together researchers, developers and teachers who systematically investigate and develop theoretical and practical accounts of task design and analysis. We welcome proposals from both researchers and practitioners and encourage contributions from all countries. Presentations and discussions will target new trends, new understanding, and new developments in research and practice.

We have a particular interest in empirically grounded contributions that underline design principles and theoretical approaches, and give examples of tasks designed for promoting mathematical development. We plan to discuss (but are not limited to) the following themes:

1. Theoretical and practical development that guides task design and analysis
2. Diverse theoretical approaches or principles that guide task design and analysis
3. Diverse practical traditions/approaches that guide task design/analysis and their theoretical accounts
4. Examples of task analysis for studying the relations between tasks, psychological development, and mathematical development.
5. Critical literature studies or meta-analysis of task design and analysis

The group will welcome contributions that focus on primary or secondary education. Research and development in task design and analysis presented at ICME-11 is retrievable at (<http://tsg.icme11.org/tsg/show/35>).

Organization

1. On the website of ICME-12 it is possible to follow the planning process and eventually access all relevant documents including the timetable for TSG sessions. Each TSG will have four 90 minute timeslots (on Tuesday, Wednesday, Friday and Saturday mornings) at their disposal. This makes TSGs the prime forum for participation.
2. We expect that participants will engage in the review process prior to the conference, and we will nominate respondents to all presentations in order to enable deeper levels of critical discussion during the conference.
3. The presenters will work in pairs and make short comments or elaborate on each other's work after every presentation. In this way, we hope to make TSG 31 into an active study group.

Guidelines for submission

The organizing team welcomes significant contributions related to the theme.

Interested participants are encouraged to email the co-chairs of TSG 31 and access the TSG 31 webpage when we begin to add contributions. Participants are requested to submit a proposal no later than November 30, 2011 both via e-mail to the two team chairs and through the on-line submission system at the Congress website.

- The length of the proposal should be between 1500 and 2000 words.
- Indicate the name(s) of the author(s), their location (town, country, school or establishment) and contact details. Proposals for contributions should be put forward no later than November 30, 2011.
- If the proposal is accepted, the final draft should be submitted on-line no later than April 10, 2012.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 31 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Xuhua Sun(China) xhsun@umac.mo

Lalina Coulange(France) lalina.coulange@free.fr, lalina.coulange@gmail.com

Team Members: Eddie Chi-keung Leung(Hong Kong) ckleung@ied.edu.hk

Nguyen Chi Thanh(Vietnam) thanhnc70@yahoo.com

Hea-Jin Lee(Korea) hlee@lima.ohio-state.edu

Liaison IPC Member: Masataka Koyama mkoyama@hiroshima-u.ac

TSG 32: Mathematics Curriculum Development

Aims

The purpose of TSG 32 is to gather congress participants who are interested in research, policy or design that focuses on mathematics curriculum development. This TSG will include presentations and discussions of the state-of-this topic area and new trends and developments in research and practice in mathematics education.

Curriculum may be thought of at various levels.

- On a national or state level, the focus is on content and goals for the primary or secondary school mathematics curriculum. In most countries central or state governments decide what students have to learn, which is described in curriculum and policy documents. What are the experiences of different countries regarding curriculum design: who is involved, what reasons are given for change, does research on the existing curriculum (e.g. into what students fail to learn) or on societal demands, inform curriculum design? Looking at specific issues, how have curricula fared with differentiated aims for children from different social and cultural backgrounds or those assumed to have different 'abilities'? How does the curriculum address extreme ranges of attainment? Research could also engage with issues of how the formal curriculum of schooled math interfaces with everyday mathematical knowledge of learners from diverse cultural contexts. On a classroom level we may think of implementation issues, such as how teachers' own pedagogical and content knowledge shapes curriculum interpretation and transaction and how they use textbooks or other materials. To what extent do teachers participate in curriculum development? What support in the form of online or textual materials or local professional development can best help teachers' use of new curricula (e.g. changes to constructivist or constructionist instruction)? And what are pupils' experiences and views on the curriculum?
- A more specific level of curriculum design concerns the developmental trajectories of mathematics content and the best way to represent them. This must address the problem of translating curricular aims in ways that teachers understand and can transact into classroom activity. There is also the important problem of alignment of assessment with aims - from international surveys to state examinations which may be used to compare school and teacher effectiveness and thus carry such high stakes that they dominate over more academic curriculum guidance.

- In relation to this theme, we especially want to solicit papers that may foster the deliberation on the varied aims of the curriculum and bring concerns and experiences from different contexts. For example what should students learn to be well prepared to participate in everyday activities of their present lives as well as at the workplace in future. Two issues arise from this, one is the role of globalization and informatization, the other concerns issues of emancipation and social justice. For different countries, different concerns may be the most pressing. For many industrialized countries, for instance, outsourcing, and computerization of work will have a strong impact on employability, and--par extension-- on the goals of mathematics education. Should these concerns be allowed to influence elementary curricula or should these be manifest only at the secondary/post-compulsory stage? However, for many students the emphasis may have to be on math for empowerment, to avoid the alienation and marginalization that formal schools tend to produce by terming the disadvantaged as 'slow learners' and 'not good enough' for more challenging/stimulating mathematical tasks. And alongside these other curricular concerns how can the transmission of traditional cultural knowledge and the needs of further and higher education in a variety of subjects be taken account of?
- Presentations on the above issues and questions could include empirical studies, theoretical studies, as well as position papers and reports from the field.

Guidelines for submission

TSG 32 will meet for four sessions of 1.5 hours each. The structure and organization of these sessions will depend upon the proposals submitted. The organizing team invites submissions of proposals for oral presentations or posters relevant to the aims and focus of TSG 32 as described above. We expect that most contributions will address one or more of the issues and questions identified above. The official language of the congress is English and proposals should be presented primarily in English. Further guidelines for submission are as follows:

1. Brief proposals for papers and posters (1000 - 1200 words) should be submitted electronically by Nov 30, 2011 both through the TSG 32 online submission system at the ICME-12 official website and by email to the co-chairs of the TSG 32.
2. Indicate whether your proposal is for a poster or an oral presentation. If your proposal is accepted, you will be invited to prepare a paper of no more than 8 pages through the TSG 32 online submission system by 10 April 2012. The template will be found at the ICME-12 website.
3. Poster presentations will be allocated time for discussion.
4. Time allocation and other details (parallel or not) about the oral presentations will be decided upon depending on the number of proposals received.
5. In case of queries and clarifications contact the two co-chairs.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 32 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Anita Rampal anita.rampal@gmail.com

Koeno Gravemeijer koeno.gravemeijer@esoe.nl

Team Members: HyeJeong Hwang(Korea) sh0502@chosun.ac.kr

Margaret Brown(UK) margaret.brown@kcl.ac.uk

Cyril Julie(SA) cjulie@uwc.ac.za

Liaison Member: Cheryl Praeger cheryl.praeger@uwa.edu.au

TSG 33: Assessment and Testing in Mathematics Education

Aims

The purpose of Topic Study Group 33 is to address issues related to assessment in mathematics at all levels and in a variety of forms. Assessment and evaluation play an important role in mathematics education as they often define the

mathematics that is valued and worth knowing. Furthermore, sound assessment provides important feedback about students' mathematical thinking that prompts student and teacher actions to improve student learning.

We are seeking contributions of research in and new perspectives on assessment in mathematics education that address issues in current assessment practices. We see these issues as falling into two main strands, large-scale assessment and classroom assessment, but also recognize that there are broad issues that fall across both strands. We invite papers that address one or more of the following topics:

1. Large-scale assessment

- Issues related to the development of large-scale assessments, which might include such areas as the conceptual foundations of such assessments, designing tasks that value the complexity of mathematical thinking, etc.
- Issues related to the purposes and use of large-scale assessment in mathematics.
- Issues related to the development of large-scale assessment of mathematics teachers' mathematical and pedagogical content knowledge.

2. Classroom assessment

- Issues connected to the development of teachers' professional knowledge of assessment and their use of assessment in the mathematics classroom.
- Issues and examples related to the enactment of classroom practices that reflect current thinking in assessment and mathematics education (e.g. the use of assessment for learning, as learning, and of learning in mathematics classrooms)

3. Broad issues

- The development of assessment tasks that reflect the complexity of mathematical thinking, problem solving and other important competencies.
- The design of alternative modes of assessment in mathematics (e.g. online , investigations, various forms of formative assessment, etc.).

Guidelines for submission

Participants interested in contributing to the ICME -12 TSG33 in Seoul are kindly requested to submit a proposal that describes their intended contribution and addresses one or more of the above issues. The proposal should be sent by November 30, 2011 both via e-mail to both of the co-chairs of the TSG and through the on-line submission system at the Congress website. The proposals must be written in English and be attached in .pdf file. The Team will then review the papers, notify participants of decisions, and may offer suggestions. The full paper is requested to be submitted by April 10, 2012 for advance distribution among the participants, and to facilitate the setup of a schedule of presentations and discussions. For a full paper, a ICME 12 - template will be available later.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 33 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Michael Neubrand(Germany) neubrand@mathematik.uni-oldenburg.de
Christine Suurtamm(Canada) suurtamm@uottawa.ca

Team Members: Belinda Huntley(South Africa) huntley@stjohnscollege.co.za
Youngsuk Lee(Korea) leyoungsuk@hotmail.com
David Webb dcwebb@colorado.edu
Liv Sissel Grønmo l.s.gronmo@ils.uio.no

Liaison IPC Member: Johann Engelbrecht Johann.engelbrecht@up.ac.za

TSG 34: The Role of Mathematical Competitions and Other Challenging Contexts in the Teaching and Learning of Mathematics

Aims

1. To gather teachers, mathematicians, mathematics educators, researchers and other congress participants who are interested in mathematical competitions and other challenging contexts in the teaching and learning of mathematics at all levels.
2. To present research results and reports on activities that will allow the group to make an updated sketch of the state of the art, thus further developing the aims of the 16th ICMI Study, and colouring it in by addressing new trends and developments in research and practice in mathematics competitions and other challenging contexts and their effect on mathematics teaching and learning. Consult www.wfnmc.org to find the aims and focus of TSG34 and the questions that may be addressed, and to learn about the goals and expectations of the organizing team and pinpoint research problems of special interest to the group. The same information will soon be available at: <http://www.icme12.org/>. The schedule for the work of the study group at ICME-12 will be announced in the near future, it will include the presentation of papers and a possible joint session with the study group on creativity. The organizing team also invites speakers to submit their papers to the WFNMC journal for possible publication in a special issue. In summary, the organizing team welcomes all contributions related to mathematical challenges, the state of the art, follow-up studies and the results of studies on the impact of these activities on mathematics education.

Guidelines for submission

Those wishing to join the study group are requested to submit a paper of between 1500 and 2500 words in length addressing issues highlighted or others that make a significant contribution to the aims and focus of the group. This contribution should be received no later than December 1, 2011 both via e-mail to the co-chairs and through the on-line submission system at the Congress website. We look forward to receiving your contributions and kindly ask all researchers who are interested in the subject to share their knowledge and experience with other members of the group. The proposals must be written in English and be attached in .pdf file. For a full paper, an ICME-12 - template will be available later.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 34 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Maria de Losada (Columbia) mariadelosada@gmail.com

Ali Rejali (Iran) a.rejali@yahoo.com

Team Members: Andy Liu (Canada) aliu@math.ualberta.ca

John Webb (South Africa) jhwebb@maths.uct.ac.za

Jaroslav Svrcek (Czech Republic) svrcek@inf.upol.cz

Kyong Mi Choi (Korea) kyongmi-choi@uiowa.edu

Liaison IPC Member: Petar Kenderov vorednek@yahoo.com

TSG 35: The History of the Teaching and Learning of Mathematics

Aims

History of mathematics teaching and learning is relatively new as a subject of international attention and research, but it is developing actively and dynamically. It became visible for the first time at ICME 10 in 2004 at Copenhagen, as the TSG29. The success and energy of these activities led to the launching of the first international journal devoted to this field of study, the International Journal for the History of Mathematics Education, which has been published since 2006. History of mathematics education then became a subject in various international meetings, for instance at the ESU-5

in Prague in 2007, ESU-6 in Vienna in 2010, and at the CERME meetings. During the TSG38 at ICME-11 in Monterrey, research into this subject proved its productivity again, with papers presented on the history of the reform movements, on the analysis of classical textbooks, and on historical practice (inside and outside institutions). Recently, the first specialized international research symposia took place in Iceland and in Portugal. On the occasion of ICME-10, a first international bibliography of research in the field was prepared. The bibliography is now retrievable at the following address: <http://www.icme-organisers.dk/tsg29/BibITSG.pdf>. This bibliography outlined streams in research: transmission and socio-cultural reform movements; aspects of teaching practice (textbooks, methods, teacher professionalization); cultural, social and political functions of mathematics instruction; and comparative studies.

Possible themes to be treated are HISTORY of:

- changes of curricula in the various countries
- changes of mathematics education as a professional independent discipline
- the cultural and social role of mathematics
- policies in teacher education
- changes and roles of teachers' associations
- the situation of journals on mathematics education
- the role of textbooks in the teaching and learning of mathematics
- general trends in the organizing of the lesson
- the overall impact of digital technologies in the learning and teaching of mathematics
- treatment of particular topics (geometry, algebra, etc.)
- interdisciplinarity and contexts
- reforms movements
- methods

Organization of the TSG35

At ICME-12, the TSGs will have four one and a half hour timeslots at their disposal. On the website of ICME-12 it will be possible to follow the planning process and eventually access all relevant documents including the timetable for TSG sessions. Participants who would like to present papers in TSG35 are requested to communicate with the team chairs. The TSG teams are responsible for establishing a scheme for paper presentation by distribution. The schedule for the work of TSG35 at ICME-12 will be announced in the due time.

Guidelines for submission

The organizing team welcomes significant contributions related to the topics outlined here and to other related issues. Participants are requested to submit a proposal not later than November 30, 2011 both via e-mails to the two team chairs and through the on-line submission system at the Congress website. The length of the proposal should be between 1500 and 2000 words. The proposals must be written in English and be attached in .pdf file. (For a full paper, an ICME-12 - template will be available later).

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 35 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Arlete De Jesus Brito (Brazil) arlete@rc.unesp.br

Fulvia Furinghetti (Italy) furinghe@dim.unige.it

Team Members: Amy K. Ackerman-Hastings (USA) aackerman@verizon.net

Kristin Bjarnadóttir (Iceland) krisbj@hi.is

Young Ok Kim (Korea) youokim@kyungnam.ac.kr

Karp Alexander(USA) *apk16@columbia.edu*

Liaison member: Barbin Evelyne(France) *evelyne.barbin@wanadoo.fr*

TSG 36: The Role of Ethnomathematics in Mathematics Education

Aims

The aim of TSG 36 at ICME-12 is to gather mathematics educators interested in the issues connected with the role of ethnomathematics in mathematics education.

This group will be an opportunity to present research or theoretical elaborations on these questions:

1. What is the mathematical thinking developed by people outside schools?
2. How can mathematics education use information regarding mathematical thinking developed outside school to improve our understanding of mathematics and mathematics teaching and learning in school?
3. How can a wider, cultural view of mathematics expand the possibilities for peace, prosperity, and elimination of discrimination?
4. What has been done in terms of research on the role of ethnomathematics in mathematics education and what are the current lines for new and relevant research?
5. Ethnomathematics can be defined both broadly and narrowly. How do these definitions influence/impact the ways in which ethnomathematics is incorporated into formal educational settings?
6. What impact is an appreciation of culture and its mathematics having on mathematics education?

Guidelines for submission

The organizing team welcomes significant contributions related to the topics outlined here and to other related issues. Participants are requested to submit a paper not later than November 30, 2011 both via e-mails to both co-chairs and through the on-line submission system at the Congress website. The length of contributions should be between 1500 and 2000 words in length. There will be a chance for lengthier papers (up to 4000 words) when a researcher or group of researchers address question number 4 on a regional level. The proposals must be written in English and be attached in .pdf file. For a full paper, an ICME-12 - template will be available later.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 36 website in the Congress Homepage.

Deadlines

November 30, 2011 Proposal submission

January 15, 2012 Notification of acceptance

April 10, 2012 Submission of Final paper and description of programme items

Organizers

Co-chairs: Pedro Palhares(Portugal) *palhares2307@gmail.com*

Lawrence Shirley(USA) *lshirley@towson.edu*

Team Members: Willy Alangui(Philippines) *wvalangui@upb.edu.ph*

Kay Owens(Australia) *kowens@csu.edu.au*

Paulus Gerdes(Mozambique) *paulus.gerdes@gmail.com*

Ho Kyung Ko(Korea) *shrine999@hanmail.net*

Liaison IPC Member: Bill Barton *b.barton@auckland.ac.nz, b.barton@auckland.ac.nz*

TSG 37: Theoretical Issues in Mathematics Education

Aims

Theoretical issues are of major importance for the field of mathematics education as for any scientific field. This is especially important because compared to other fields mathematics education is rather a young research area that often builds on scientific knowledge of neighboring fields. Therefore it is important to develop theories specifically meeting the needs of mathematics education. Continuing the work carried out in previous ICMEs, this TSG is expected to provide the participants with an up-to-date vision of the state of the reflection regarding the theoretical questions and underpinnings

of the field, and at the same time stimulate insightful exchanges and discussions. It is expected to pay specific attention to the diversity of theoretical approaches existing in the field and to the efforts undertaken to address this diversity, to the theoretical advances and debates resulting from the efforts made for improving the relationships between research and practice, and to the influence of contexts and cultures on the ways in which theories are developed and used.

Call for papers

We invite the following submission types:

- Research Reports (2000 words)
- Short Oral Presentations (500 words)
- Posters (500 words)

Submissions should include concrete examples and could employ (but are not limited to) the following approaches:

1. Theories from outside mathematics education:

- Identifying theories particularly suitable for use in mathematics education (and those that are not);
- Contrasting the treatment of particular constructs relevant to mathematics education (e.g. "mathematical objects") within two or more theories;
- Suggesting inadequacies in the capacity of currently available theories to meet the needs of mathematics education and recommending what developments are required.

2. Diversity of theories within mathematics education:

- Addressing the challenge of utilizing the results of research studies in mathematics education undertaken using different theories;
- Networking strategies (such as comparing, contrasting combining, coordinating, integrating, synthesizing) designed to provide heightened insight into a complex setting;
- Reporting or exploiting examples of the networking of theories concerning their limits and potential for advancing the field of mathematics education.

3. Conditions for theory use and development:

- Interrogating the role and function of theories in mathematics education (and mathematics education research) with specific examples;
 - Exploring the adequacy of a particular theory to provide insight into two or more different contexts or issues in mathematics education;
 - Discussing the methodological entailments of the selection of particular theories in the process of research design.
- Keywords: theories, theories in mathematics education, methodology, networking of theories, theoretical inclusivity

Organization

At ICME-12, the TSGs have four 90-minute timeslots in the conference program. This makes TSGs a prime forum for participation. In TSG 37, we would aim to maximize that participation in the following ways:

1. Prior to the conference a limited number of preparatory readings will be posted through the conference website;
2. Each of the four sessions will include up to two full paper presentations (25 minutes each) and up to four short oral presentations (ten minutes each) in such combination as to allow at least 30 minutes discussion distributed across each session;
2. Poster presentations associated with this TSG are welcome, and participants will be directed to these outside TSG timeslots, however it is assumed that poster authors will be present and that issues arising from posters may feature in discussion;
3. Depending on submissions received, each of the four sessions will be structured around one or more of the approaches outlined above.

How to contribute

1. Proposals are expected to be written in English with Title, Name(s) and e-mail addresses of the author(s), Institution, Country, Abstract (max. 10 lines), Main text, References, and Appendices (optional).
2. For submissions, please use the standard PME formatting requirements (for example the one of PME34) (For a full paper, a ICME 12 - template will be available later)
3. Submissions should be sent by November 30, 2011 both via e-mail attachments to the co-chairs and the Liaison IPC member and through the on-line submission system at the Congress website.

4. Prior to the conference we expect participants to take part in a review process in order to increase the quality of the presentations.

On-line submission

Go to <My Page> at the first page of the Congress Homepage <http://icme12.org> or press <Submit your proposal> button on TSG 37 website in the Congress Homepage.

Deadlines

November 30, 2011 Deadline of submission of all proposals (word limits as specified above)

January 15, 2012 Notification of acceptance of proposals

April 10, 2012 Submission of final draft of all scientific activities to IPC

Organizers

Co-chairs: Angelika Bikner(Germany) bikner@math.uni-bremen.de

David Clarke(Australia) d.clarke@unimelb.edu.au

Team Members: Cristina Sabena(Italy) cristina.sabena@unito.it

Minoru Ohtani(Japan) mohtani@kenroku.kanazawa-u.ac.jp

Gelsa Knijnik(Brazil) gelsak@unisinob.br

Jin Young Nam(Korea) ynam@kice.re.kr

Liaison IPC Member: Michèle Artigue michele.artigue@univ-paris-diderot.fr

Discussion Groups

Contrary to past ICME practice, Discussion Groups for ICME-12 will be created in response to a proposal submitted by a group of up to five persons representing diverse regions of the world. As their name suggests, Discussion Groups (DGs) are designed to gather Congress participants who are interested in discussing, in a genuinely interactive way, certain challenging, controversial or emerging issues and dilemmas of interest to an international or regional audience. The focus of DGs should be distinct from the subjects covered in the Topic Study Groups (TSG) (see Topic Study Groups for a listing of the TSGs for ICME-12) but could discuss a specific issue in greater detail than that of a TSG. Each DG will be allocated two time slots of 90 minutes each during the Congress.

The Organizing Teams(OT) will be expected to:

- Set up and maintain the DG web page

Before the congress, the discussion group organizing team will post their page at the ICME-12 web site (<http://icme12.org>) including contributions that define, limit, and/or present basic premises, theoretical considerations, research findings, viewpoints and facts that should be accounted for if a fruitful discussion is to be attained. Prior to the congress, participants can send individual contributions to the organizers for consideration as additional background information and may raise questions or participate in an exchange of ideas through the web site.

- Produce a progress report by December 30, 2011
- Submit a final description of the DG program to be included in the final program booklet
- Organize and manage the DG sessions during the Congress
- Produce a final report for the ICME-12 Proceedings

Deadline Summary

December 30, 2011 Progress report

April 10, 2012 On-line submission of final version of the DG program

DG 1: Current Problems and Challenges in Non-university Tertiary Mathematics Education (NTME)

Organizing Team

Co-Chairs: James Roznowski(USA) jroznowski@harpercollege.edu

Low-Ee Huei Wuan(Singapore) lowhw@sp.edu.sg

Team Members: Vilma Mesa(USA) vmesa@umich.edu

Sadie Bragg(USA) sbragg@bmcc.cuny.edu

George Ekol(Uganda) george.ekol@gmail.com

Richelle Blair(USA) richelle.blair@sbcglobal.net

Cheryl Cleaves(USA) ccleaves@amatyc.org

Steve Krevisky(USA) skrevisky@mxcc.commmnet.edu

Fary Sami(USA) fsami@harford.edu

Marilyn Mays (USA) memays@dcccd.edu

Marcos Zyman (USA) mzyman@bmcc.cuny.edu

Laura Watkins (USA) laura.watkins@gmail.com maricopa.edu

Margie Hobbs (USA) margiehobbs@bellsouth.net

Felix Apfalter (USA) fapfalter@bmcc.cuny.edu

Liaison IPC Member: Johann Engelbrecht johann.engelbrecht@up.ac.za

Aim & Rationale

Description

This discussion group will gather congress participants interested in exchanging ideas, and discussing issues and challenges related to mathematics education in non-university tertiary institutions, post-secondary education institutions around the world. Discussions at previous ICME conferences indicate that students who attend these institutions are more likely to be career oriented, have less funding available for college, and are underprepared for post-secondary education. Many students at non-university tertiary institutions are interested in securing a two-year degree of some kind, while others seek to pursue education beyond the non-university tertiary institution. The questions below have been developed following DG 23 at ICME-11 and other international committee discussions, including focus on the diversity of student preparation and career goals of students at non-university tertiary institutions.

Aim

Anticipated aims of the DG sessions include identifying, sharing, and discussing solutions to common key issues, challenges, and opportunities pertaining to all areas of mathematics education in non-tertiary institutions throughout the world. The DGs will also extend ICME-12 conversations and presentations from TSG 2: Mathematics education at tertiary level and access to tertiary level.

Rationale

The discussion group format at ICME conferences provides an excellent platform and venue for sharing ideas related to all areas of mathematics education in non-tertiary institutions throughout the world. In the US, "community colleges" are one type of institution responsible for the first two-years of a college degree. These colleges are an important feature of tertiary education in mathematics, with 46% of all undergraduate mathematics education being taught in US community colleges. Faculty teaching at these US community colleges network and share successes and failures on a regular basis. However, there are few opportunities for gatherings and discussions with faculty from countries with institutions having similar structures, course offerings, students, and programs. The DGs of past ICME congresses have provided an important avenue for exchange of ideas and networking and have helped shape the current education environment. The goal of the DG at ICME-12 is to continue the good work from previous ICME conferences.

One goal of the ICME-12 DGs is to better understand the role these institutions play in our countries, our societies and our economies. Non-university tertiary institutions are increasingly important in education. For the many students who did not leave their secondary institutions well-prepared for further education or the workforce, these institutions provide an educational bridge. For adults who never had an opportunity for education because of political unrest, poverty, or social custom, the institutions provide that opportunity. But more importantly, these institutions are increasingly becoming the choice of students who desire a practical education, grounded in the realities of emerging technology and global economics.

Key Questions

The following questions will be discussed in the ICME-12 DGs, extending the discussion DG 23, Current problems and challenges

in non-university tertiary mathematics education, offered at ICME-11 and the presentations from TSG 2: Mathematics education at tertiary level and access to tertiary level to be presented at ICME-12. In addition to issues on faculty development and professional growth, teaching and learning facilities, policy issues, graduate placement and general work environment, the specific questions to be addressed in the DG at ICME-12 are:

1. What challenges related to teaching, learning, curriculum, and assessment do faculty and students face that are unique in the Non-university Tertiary Mathematics Education (NTME) environment?
2. What opportunities are available to non-university tertiary institutions that are not present in traditional four-year institutions? How are these challenges and opportunities being addressed within those institutions or across groups of institutions?
3. What are examples of research-based promising practices that enrich mathematics programs in non-university tertiary institutions? How are these programs evaluated, in terms of conceptual understanding, procedural skills, cognitive and thinking skills, and in more global measures such as students' completion of degrees?
4. What are the new developments in the student learning of mathematics and assessment of student learning that are uniquely suited to non-university tertiary institutions?
5. What are examples of innovations regarding the use of technology in mathematics education leveraging the teaching and learning of mathematics? How is the impact of these innovations measured and assessed at the institutional and department level?
6. Is the mathematics preparation of students in secondary schools a good preparation for courses and programs in non-university tertiary institutions?
7. In what ways are placements tests used to determine college readiness and assess the mathematics that students need to know in non-university tertiary institutions?

DG 2: Creativity in Mathematics Education

Organizing Team

Chair: Hartwig Meissner(Germany) meissne@uni-muenster.de

Team Member: Emiliya Velikova(Bulgaria) evelikova@uni-ruse.bg

Jong Sool Choi(Korea) choijon@kaist.ac.kr

Vince Matsko(USA) vince.matsko@gmail.com

Mark Applebaum(Israel) mark@Kaye.ac.il

Ban Har Yeap(Singapore) banhar.yeap@pathlight.org.sg

Liaison IPC Member: Bernard Hodgson bhodgson@mat.ulaval.ca

Aim & Rationale

Mathematical Creativity and Mathematical Giftedness are two main strands in mathematics education. They overlap and interact, but they still have their particular issues and frameworks. This is why the International Group for Mathematical Creativity and Giftedness (MCG), an ICMI Affiliate Organization, after ICME 11 in Mexico suggested very early that also ICME 12 should plan for two strands – one on mathematical creativity and a separate strand on mathematical giftedness and talent. One strand might be part of the Topic Study Groups and the other part of the Discussion Groups so that ICME 12 participants may attend both. At ICME 11, these were TSG 6: Activities and programs for gifted students and DG 9: Promoting Creativity for All Students in Mathematics Education. Both strands at ICME 11 were well-attended.

The IPC for ICME 12 already decided on the TSG themes. Mathematical Giftedness is in the center of TSG 3 (Activities and programs for gifted students). But Mathematical Creativity is not included in the list of TSG topics. This is why the above mentioned team suggests to establishing at ICME 12 a Discussion Group on Creativity in Mathematics Education.

Key Questions

Creativity is a component of doing mathematics. The Discussion Group shall focus on the following questions:

1. What does creativity mean in the process of teaching and learning mathematics?
 - How might creativity be defined, recognized, and/or assessed?
 - Is creativity an unconscious or intuitive component of doing mathematics?
 - Is creativity something that all students can develop or must students be gifted to be creative?
2. How can we develop or stimulate creative activities in and beyond the mathematics classroom?
 - Is mathematical creativity something that can be taught?
 - What can teachers do to foster creativity?

- How can we use technology to promote mathematical creativity?
 - What mathematics activities outside the classroom might be used to develop mathematical creativity?
 - What is the role of creativity in assessment, curricula, mathematics competitions, and other aspects of mathematics education?
3. How might we balance mathematical skill training and mathematical creativity?
 4. What should be done in teacher training programs at the pre-service and in-service levels to foster creativity in the classroom
- The list of questions may be changed or amended according to pre-conference inputs from prospective DG participants. After notification of acceptance, a DG website will be set up. Since effective discussions need a strong input and a broad spectrum of expertise prospective participants will be invited as soon as possible to sending individual contributions, or raise questions, or submit ideas, or offer background information to the OT members. Papers accepted from the OT for the DG will be made available to all DG participants on the website prior to the congress ('Presentation by Distribution', with a dead line given before). A more final program for the two sessions will be developed after getting the feedback from the individual contributions of prospective participants.

DG 3: Issues Surrounding Teaching Linear Algebra

Organizers

Co-chairs: Avi Berman(Israel) berman@technion.ac.il

Sang-Gu Lee(Korea) sglee@skku.edu

Team Members: Steven Leon(USA) sleon@umassd.edu

Sepideh Stewart(New Zealand) stewart@math.auckland.ac.nz

David Strong(USA) David.Strong@pepperdine.edu

Liaison IPC Member: K.(Ravi) Subramaniam subra@hbcse.tifr.res.in

Aim & Rationale

Linear Algebra is one of the most important courses in the education of mathematicians, scientists, engineers and economists. The International Linear Algebra Society (ILAS) was founded in 1989. Its general goal is to encourage activities in linear algebra. These activities include teaching and learning of Linear Algebra which is one of the most important disciplines in the education of mathematics. (<http://www.math.technion.ac.il/iic/>) ILAS' Education Committee handles undergraduate and graduate Linear Algebra studies. Among others, it operates a joint NSF- ILAS Project to Augment the Teaching Linear Algebra through the use of Software Tools (ATLAST). The project has offered several workshops in various places. The committee would greatly appreciate the opportunity of many mathematicians and mathematics educators meeting in ICME 12 to hold a discussion group on teaching and learning of Linear Algebra.

We can discuss many topics: motivation, challenging problems, visualization, learning technology, preparation in high school, history of Linear algebra, research topics at different levels (from high school to doctorate).

Key Questions

We would like to discuss the following key questions:

1. What is the meaning of understanding linear algebra?
2. How can we improve students' conceptual understanding of linear algebra concepts?
3. How can we encourage students to think in the formal world of mathematics?
4. What are some of the major difficulties that linear algebra students encounter?
5. What skills do we want students to take away from a linear algebra course? Do our exams really test these skills?
6. Can one see linear algebra (visualization, geometry)? How can we educate the students to see the beauty of Linear Algebra and its importance?
7. Discussion of constructive and innovative ways to use technology in the teaching of linear algebra (Sage, MATLAB, clickers, etc.).
8. Should a second course in linear algebra be required for all undergraduate mathematics majors/ science students / engineering students? If so, how do we go about convincing departments to require a second course in linear algebra? (other questions may be identified by intending participants)

DG 4: The Evolvement of Mathematics Teachers' Community-of-Practice

Organizers

Co-Chairs: Nitsa Movshovitz-Hadar (Israel) nitsa@technion.ac.il

Atara Shriki (Israel) Shriki@technion.ac.il

Team Members: Jiansheng Bao (China) jsbao@math.ecnu.edu.cn

Barbara Clarke (Australia) barbara.clarke@monash.edu

Diane Resek (USA) ressek@sfsu.edu

Liaison IPC Member: Gabriele Kaiser gabriele.kaiser@uni-hamburg.de

Aim & Rationale

A successful implementation of educational changes depends on teachers' professional learning, and their ability to translate innovative ideas into practice. Although teaching, by its very nature, is a complex practice, most teachers work in isolation, making their own planning and decisions, and solve pedagogical problems with limited consultation with and feedback from their colleagues.

The past decade has seen increasing demand to improve school mathematics, which, as a result, generated a need for teachers to join forces and share individual knowledge and experience with the community. Thus, the need to nurture mathematics teachers' communities of practice became a primary goal.

Wegner (1998), who coined the term "community of practice" (CoP), maintains that in order for a community to be recognized as a CoP, a combination of three characteristics, cultivated in parallel, is necessary:

1. The domain: A CoP is identified by a common domain of interest;
2. The community: A CoP consists of members who are engaged in joint activities and discussions, help each other, share information, and build relationships that enable them to learn from one other;
3. The practice: Members of a CoP are practitioners. They develop a shared repertoire of resources, such as experiences, stories, tools, and ways of addressing recurring problems, thus learn with and from each other. In general, national communities of mathematics teachers conform to Wegner's first two characteristics: they definitely share an interest in mathematics, its teaching and learning, and in many countries they meet in professional conferences, read professional journals, and share a professional jargon enabling them to learn from one another. However, the third characteristic, to a large extent, is still missing in many communities of mathematics teachers, as only few develop a shared repertoire of resources. Even those communities of mathematics teachers who do develop such resources usually count on leaders of the community to put together such resources for the benefit of the entire community. In light of the above, the proposed Discussion Group will focus on issues related to the formation of a mathematics teachers' CoP and to the on-going handling of such CoP from both theoretical and practical points of view.

Key Questions

Session no. 1: *Triggers and needs for CoPs to be formed – theory and practice*

A short introduction to provide the background and framework for the discussion – Views from three continents

Barbara Clarke (Early Numeracy Research Project, Australia): Professional learning teams as communities of practice;

Jiansheng Bao (School based Teaching and Research System, China): What kind of help do mathematics teachers need for their teaching?

Diane Resek (The Revitalizing Algebra Project in the United States): What activities for teachers can promote a productive community of practice where students become more successful? Introduction of the Revitalizing Algebra Project in the United States

The Discussion

Attendants of the DG will be asked to form 5 subgroups (each chaired by one of the OT members) to discuss the following questions:

1. What triggers and needs for CoPs to be formed, can you identify based upon your own experiences/beliefs/research? Who are the initiators and what are their drivers?
2. In as much as possible, please anchor your perceptions in a theoretical framework. Each subgroup will summarize and present its main findings to the whole group. This will be followed by a whole group discussion focusing on characterizing the main issues a mathematics teachers' CoP should be concerned about, and questions or dilemmas worth of further investigation.

Session no. 2: *On-going handling of mathematics teachers' CoP – theory and practice* A short introduction to provide the background and framework for the discussion:

Nitsa Movshovitz-Hadar (Former head of the high-school center of mathematics teachers, Israel): Significant attributes of CoP that make it important to maintain and develop a mathematics education CoP as characterized in the 1st session

Atara Shriki (Wiki-Math-Ed project, Israel): The rationale for exploiting the potential of a Wikibased platform for an on-going support of a mathematics teachers' CoP.

The Discussion

Attendants of the DG will be asked to form 5 subgroups (each chaired by one of the OT members) to discuss the following questions:

1. What models or practices have been found effective for encouraging the development and supporting the existence of a mathematics teachers' CoP in your country?
2. What might be the appropriate ways to help teachers trust each other so they can talk about their real feelings and concerns about their professional strengths and weaknesses?
3. What means are used for maintaining and the on-going revitalizing of the CoP – e.g. leadership by external experts? Teachers' assuming responsibility? empowerment? Government financial support?

Each subgroup will summarize and present its main findings to the whole group. This will be followed by a whole group discussion focusing on: What have we learned and how might we summarize our discussions? Culminating a discussion of possible future international collaboration (a book?)

DG 5: Uses of History of Mathematics in School (pupils aged 6 - 13)

Organizers

Co-Chairs: Bjørn Smestad(Norway) bjorn.sme stad@lui.hio.no

Funda Gonulates(USA/Turkey) fgonulates@gmail.com

Team Members: Narges Assarzadegan(Iran) narges.assarzadegan@gmail.com

Kathleen Clark(USA) kclark@fsu.edu

Konstantinos Nikolantonakis(Greece) nikolantonakis@noesis.edu.gr

Liaison IPC Member: Evelyne Barbin evelyne.barbin@wanadoo.fr

Aim & Rationale

For more than twenty years, the number of people studying relationships between history of mathematics and pedagogy of mathematics has been steadily increasing. One landmark work was the 2000 ICMI Study, History in Mathematics Education, which gave a comprehensive overview of the field at the time. (Fauvel & van Maanen, 2000)

The publication of the 2000 ICMI study raised awareness that history of mathematics in teaching mathematics:

- allows pupils to experience the process of mathematics - problem solving, proof construction (e.g., Lakatos, 1976; Ernest, 1998);
- provides the landscape of Guided reinvention (Freudenthal, 1991);
- expands understanding of nature of mathematics; that is, mathematics is not "finished" and continues to evolve and some ideas are subject to change (Ernest, 1998); and
- often relies on not taking the end results of mathematicians' works as starting points (Freudenthal, 1973) aimed at progressive mathematization (Gravemeijer & Doorman, 1999, p. 116).

The International Study Group on the Relations Between the History and Pedagogy of Mathematics (HPM Group) has been active since 1976. In addition to numerous publications and participation in several conferences (e.g., European Summer University; CERME), the HPM Group hosts an ICME satellite meeting every four years. Although a number of papers resulting from these conferences concerns the inclusion of history in primary and secondary school (pupils aged 6 – 16), the result is still that there are not many resources available for teachers who teach mathematics to students aged 6 – 13. An analysis of 130 papers from the HPM satellite conferences in 2000 and 2008, published in HPM Newsletter No. 77, shows that there are far more papers for pupils aged 14 – 19 than for 6 – 13. (Smestad 2011)

The inclusion of history of mathematics in primary and secondary school often does not go further than storytelling and the purpose of the use of historical content is more to increase student motivation instead of deepening student learning. (Smestad 2003, 2004) However, in the general literature there are several other examples, including:

- working with original sources (that can include historical pictures or historical texts from textbooks or other sources);
- using old techniques or algorithms;

- using concrete materials in ways they were used in history, such as clay tablets or counting boards;
- performing plays on the history of mathematics;
- exercises based on the history of mathematics, either implicitly or explicitly;
- incorporating cross-curricular approaches;
- completing projects on mathematicians; and
- producing exhibitions.

There is a need for discussions on which methods of working with history of mathematics are suitable for younger children and which are aligned with their particular topics of study. Furthermore, there is need for discussion on which of the goals outlined above are of particular interest when working with younger children.

References

- Ernest, P. (1998). *The History of Mathematics in the Classroom. Mathematics in School*, 27(4), 25-31.
- Fauvel, J., & Van Maanen, J. (2000). *History in mathematics education: An ICMI Study*. Dordrecht: Kluwer Academic Publishers.
- Freudenthal, H. (1973). *Mathematics as an educational task*: Reidel.
- Freudenthal, H. (1991). *Revisiting mathematics education: China lectures*: Kluwer Academic Publishers.
- Gravemeijer, K., & Doorman, M. (1999). *Context Problems in Realistic Mathematics Education: A Calculus Course as an Example. Educational Studies in Mathematics*, 39(1), 111-129.
- Lakatos, I. (1976). *Proofs and refutations: the logic of mathematical discovery*: Cambridge University Press.
- Smestad, B. (2003). *Historical topics in Norwegian textbooks*. In O. Bekken & R. Mosvold (Eds.), *Study the Masters: The Abel-Fauvel Conference* (pp. 153-168). Kristiansand: NCM.
- Smestad, B. (2004). *History of mathematics in the TIMSS 1999 Video Study*. In F. Furinghetti, S. Kaijser & C. Tzanakis (Eds.), *HPM2004 & ESU5* (pp. 278-283). Uppsala, Sweden: Uppsala Universitet.
- Smestad, B. (2011). *A brief analysis of HPM papers*. *HPM Newsletter*(77).

Key Questions

1. Which ideas from HPM can be used with children (aged 6-13) in such a way that produces a good result(e.g. improved student engagement, positively impacted student learning)?
2. What would be criteria for finding, developing and selecting materials to be used with children (aged 6-13)?
3. How does the HPM community in particular (and mathematics education community more broadly) assure that high quality material that cover a variety of topic are produced and shared?

DG 6: Postmodern Mathematics

Organizers

Co-Chairs: Paul Ernest(UK) p.ernest@ex.ac.uk

Regina Möller(Germany) regina.moeller@uni-erfurt.de

Team Members: Ubiratan D'Ambrosio(Brazil) ubi@usp.br

Allan Tarp(Denmark) allan.tarp@mathecademy.net

Sencer Corlu (USA) sencer@tamu.edu

Extra Members: Gelsa Knijni (Brazil) gelsak@uol.com.br

Maria Nilokakaki(Greece) mnikolak@yahoo.gr

Liaison IPC Member: Michèle Artigue michele.artigue@univ-paris-diderot.fr

Aim & Rationale

The goal of the discussion group is to elucidate the multiplicity of the subject of mathematics: to explore and share how postmodern perspectives offer new ways of seeing mathematics, teachers and learners. The two key themes are

Theme 1: Perspectives of mathematics as having multiple dimensions / components

Theme 2: Multiple-self perspectives of the human subject (teacher/ learner/ researcher)

These will be used as organizing themes for the two sessions

Postmodernism rejects a single authoritative way of seeing mathematics, teachers and learners, for each can be seen and interpreted in multiple ways. Mathematics can be seen as axiomatic and logical leading to indubitable conclusions, but it can also be seen as intuitive and playful, open-ended, with surprises and humour, as evidenced in popular mathematical images and cartoons. Additionally it can be seen in its applications in science, information and communication technologies, everyday life and

ethnomathematics. All of these dimensions are part of what makes up mathematics and they all co-exist successfully.

It is also important to recognize that all human subjects have multiple selves and that we all (mathematicians, teachers and learners) have access to different selves: authoritative knowers, researchers, learners, appreciators and consumers of popular and other cultures, as well as having non-academic selves. Thus mathematics teachers can be seen as epistemological authorities in the classroom as well as co-explorers of unfamiliar realms both mathematical and cultural, and as ring-masters in the mathematical circus. Students can be seen as receivers of mathematical knowledge, but also as explorers and interpreters of mathematical and cultural realms that can be related to mathematics.

All of these perspectives and selves are resources we can use to enhance the teaching and learning of mathematics, but many are currently overlooked or excluded. The aim of the Discussion Group is to raise and discuss these ideas and explore and generate examples relevant to classroom practices. Papers and resources will be available on-line before the conference so that participants can prepare themselves and so that presentations can be kept short and most of the time is devoted to discussion. Examples will also be distributed in hard copy in the sessions.

Key Questions

1. What is postmodern thinking in mathematics and mathematics education? What is new or different about it and what are the implications for research in mathematics education?
2. Given a postmodern multiple-perspectives view of mathematics what illuminations and surprises can be found for mathematics and its teaching and learning in multidisciplinary sources including: history of mathematics, ethnomathematics, science, information and communication technology, art works, stories, cartoons, films, jokes, songs, puzzles, etc.?
3. How might the new emphases and differences foregrounded by postmodern perspectives impact in the primary and secondary mathematics classrooms? What concrete examples serve to illustrate these differences?
4. How can a multiple-selves view of the human subject be reflected in the mathematics classroom and in mathematics teacher education? How can a multiple-selves view of the teacher facilitate teacher education?

DG 7: Improving Teacher Professional Development Through Lesson Study

Organizers

Co-Chairs: Toshiakira Fujii(Japan) tfujii@u-gakugei.ac.jp

Akihiko Takahashi(USA) atakahas@depaul.edu

Team Members: Susie Groves(Australia) susie.groves@deakin.edu.au

Nina Boswinkel(Netherlands) n.boswinkel@slo.nl

Yo-An Lee(Korea) yoanlee@sogang.ac.kr

Liaison IPC Member: Mercy Kazima(Malawi) mkazima@chanco.unima.mw

Aim & Rationale

As stated earlier, the purpose of this proposed Discussion Group is to facilitate discussion and initiate collaborative research with colleagues around the world to seek effective ways to improve teacher professional development through Lesson Study. Lesson Study was introduced to the US mathematics education community in the 1990s (Yoshida, 1999; Lewis, 1993; Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999) and gradually spread among researchers and educators in the US and subsequently around the world. Although research suggests that professional development like Lesson Study should be an ideal approach to help teachers acquire mathematical knowledge and develop skills for teaching mathematics, only a few effective implementations of Lesson Study have been reported.

There are at least two possible impediments to the effective implementation of lesson study. First, Lesson Study is a cultural activity among Japanese teachers and schools, and is not easy to replicate in schools in other cultural settings. Secondly, although the process of Lesson Study has been described based on the careful observations of Japanese teachers' activities, the mechanism by which Lesson Study improves teaching may not be fully understood. As a result, implementations often mimic superficial features of Lesson Study without having much impact on overall teaching. In order to overcome this dilemma and establish a systematic professional development program among schools in different situations, there is a need for discussion among researchers and educators in order to exchange knowledge and expertise about innovative professional development approaches such as Lesson Study.

Key Questions

The key questions to be addressed by this proposed Discussion Group are:

1. What are the key elements of Lesson Study that can help teachers gain mathematical knowledge for teaching?
2. What are the key elements of Lesson Study that can help teachers develop expertise in teaching mathematics effectively?
3. How can an established effective professional development model such as Lesson Study be translated for use in different cultures?
4. How can a professional development model such as Lesson Study be adapted for use in pre-service teacher education?

DG 8: Theory and Perspective of Mathematics Learning and Teaching from the Asian Regions

Co-Chairs: Chun Chor Litwin Cheng(Hong Kong) cccheng@ied.edu.hk

Hong Zhang(China) Zhanghongredg6@163.com

Team Members: Eunmi Choi(Korea) emc@hnu.kr

Po-Hung Liu(Taiwan) liuph@ncut.edu.tw

Lianghuo Fan(UK) L.Fan@soton.ac.uk

Liaison IPC Member: Shiqi Li sqli@math.ecnu.edu.cn

Aim & Rationale

The aims of the DG comprise the following:

1. To identify present theories and framework of mathematics teaching and learning of the Asian regions.
2. To share and discuss significant trends and development in local theories of mathematics teaching and learning in Asian classrooms.
3. To provide both an overview of the current practice of what is happening in the classroom and the underpin framework that make such practice successful.
4. To promote the teaching of mathematics by investigating the learning theory and framework of the Asian regions.

Key Questions

The DG will focus on empirical and theoretical and developmental ideas on comparison of the learning theories appeared in Asian regions. The DG would like to address the following Key Questions:

1. How mathematics is taught and learned in the Asian regions for primary and secondary mathematics?
2. Under what influence or theories does the pedagogical content knowledge or didactical knowledge in mathematics is developed in the Asian classroom?
3. Are there any different approach/frameworks between primary and secondary levels teaching in the Asian classrooms?
4. Are there any theoretical perspectives or conceptual frameworks for mathematics teaching at the Asian classroom?
5. How and why such teaching / learning practice in the Asian classroom?
6. What is the training of a mathematics teacher in the Asian regions?
7. How to analyze the possible trend in the classroom teaching in the Asian region, with respect to individual circumstances of local theories of learning?
8. What is the context of the existing theories of learning in mathematics in Asian classroom?
9. What is the possible development of the theory and framework of the theories used in the Asian classrooms?
10. What kind of topics (secondary/primary) in mathematics are being taught based on certain theories, and which kind of topics are less likely to employ using a theory in teaching?

DG 9: Using Technology to Integrate Geometry and Algebra in the Study of Functions

Organizers

Co-Chairs: Scott Steketee(USA) stek@kcptech.com

Cheah Ui Hock(Malaysia) uhcheah@recsam.edu.my

Team Members: Ang Keng Cheng(Singapore) kengcheng.ang@nie.edu.sg

Aleksandra Cizmesija(Croatia) cizmesij@math.hr

Ali Delice(Turkey) alimdelice@yahoo.co.uk

Liaison IPC Member: Hee Chan Lew hclew@knue.ac.kr

Aim & Rationale

For several years now, a number of mathematics educators and educational researchers have advocated using mathematical functions as the unifying principle of secondary students' study of algebra. But for too many students, our current approach to

teaching about functions isn't working.

The abstract concept of function (including independent and dependent variables, domain, range, covariation, related rates of change, composition, inverse, and so forth) is difficult for students to master in the symbolic realm of algebra. Students' understanding of functions is insufficiently grounded in concrete experiences varying the independent variable and observing the resulting behavior of the dependent variable. Too many students graduate from secondary schools with a poor understanding of these concepts.

Various studies have examined the effects of studying geometric transformations on students' development of a sophisticated concept of function, and some secondary- education curricula have been developed that present geometric transformations as functions. It seems reasonable to think that students may find the concrete, visual nature of geometric transformations (such as translation, reflection, rotation, and dilation) more accessible than abstract symbolic forms (such as $f(x) = x^2 - 3x + 2$).

Modern dynamic mathematics software has shifted the ground by enabling students to directly and continuously drag geometric variables (points) and to observe and analyze dynamic visual depictions of function behavior. Integrating a technology- based geometric approach into students' study of algebraic functions would seem to have considerable potential benefit to students' development of a robust and flexible conception of function.

Nevertheless, few of today's students have the opportunity to integrate transformations into their understanding of functions, and even fewer begin their study of function with geometric transformations.

We start our discussion from this point of view: that understanding functions is hard for many students, that students can benefit from integrating geometric transformations into their study of algebraic functions, that technology facilitates the manipulation and visualization of transformations as functions, and that too few students experience transformations as functions.

One aim of our discussion will be to examine why geometric transformations are not already more widely integrated into the study of function. What are the benefits, and what are the obstacles?

A second aim will be to share our experiences, both successes and failures, in efforts to develop and promote such an approach.

And a third will be to strategize with each other, to consider how best to encourage and facilitate such a change in students' experience of function.

Thus it is our hope that through this discussion group we can consider some of the issues involved in integrating a geometric approach into the study of function, identify potential advantages and pitfalls, discuss how this approach might relate to and modify existing curricula, contemplate the need for the professional development of teachers, and generally help to jump start the related processes of research on and implementation of such a curricular change.

Key Questions

The following questions are suggested as starting points of the discussion:

- What are the potential advantages and disadvantages of integrating a geometric approach into the study of function?
- What role does technology play in integrating a geometric approach into the study of functions?
- Twenty years after the introduction of dynamic mathematics software, why have there not been more research studies on this approach, and why has there been so little adoption in schools?
- What research has actually been done, and what additional research needs to be done, to validate this approach?
- How well are students able to integrate the geometric and algebraic views of various concepts? For instance, how well does a student's understanding of covariation in the geometric context transfer to the symbolic context?
- What factors bear on this transfer of learning? How can we best encourage students to connect their learning in the two realms?
- What other cognitive obstacles must students overcome?
- Which aspects of the study of function can be developed geometrically, and which cannot?
- What approaches to professional development are likely to be effective in helping teachers understand the approach and develop enthusiasm for it?
- How does this approach relate to ongoing curriculum reform efforts in various regions or countries?
- How can we in our professional roles best help move this process forward?

DG 10: New Challenges in Developing Dynamic Software for Teaching and Learning Mathematics

Organizers

Co-Chairs: Zsolt Lavicza(UK) zl221@cam.ac.uk

Markus Hohenwarter(Austria) markus.hohenwarter@jku.at

Team Members: Adrian Oldknow(UK) aoldknow@yahoo.co.uk

Tolga Kabaca(Turkey) tolgakabaca@gmail.com

Kyeong Choi(Korea) mathcare@gmail.com

Liaison IPC Member: Frederick Leung frederickleung@hku.hk, hraslks@hku.hk

During the past decades a number of different types of mathematical software have been developed. Among the most often utilised software types in education are Computer Algebra Systems (e.g. Derive, Mathematica, Maple, Maxima), Dynamic Geometry Systems (e.g. Cabri Geometry, Geometer's Sketchpad, Cinderella, GeoNEXT), Spreadsheet and Statistics Software (e.g. Excel, SPSS, Fathom, R). Some of the software has been designed primarily for use in research while others were designed primarily for teaching. In recent years three important trends have emerged in the development of such software tools. 1) The design of research oriented software products increasingly includes features and support for educational purposes; at the same time teaching oriented software has become more powerful and sophisticated, with the result that its use in research contexts is also increasing. 2) The distinction between different types of software has become blurred as many products integrate features previously associated with other types of software. For instance, many software now connect several fields of mathematics and it is possible to design applications that allow to observe relationship among a variety of areas such as geometry, algebra, statistics etc. 3) Computer platforms are rapidly diversifying; with the appearance of smart phones, tablets, and Interactive Whiteboards (IWB) in recent years, as well as online services such as Wolfram Alpha, challenging the design and development of mathematics software.

The aim of this discussion group is to stimulate discourse between colleagues involved in developing and researching the use of mathematical software. The group will identify the key challenges and directions for development for the forthcoming decade.

Key Questions

- What are the most important challenges in developing mathematical software for teaching?
- How do new hardware platforms (e.g. smart phones, tablets, IWB) alter the functionality and features of mathematical software?
- How best to cater for cultural differences?
- How best to implement localization of software?
- How can software be developed which is both increasingly more powerful, but also easy to use?
- What can we learn from the successes and failures of software applications?
- What are the research priorities for software development?
- What kinds of research projects are necessary to support the development of software?
- What kinds of hardware are best suited for effective use of software?
- How can the design of mathematical software best be developed to support STEM/MST education?

DG 11: Mathematics Teacher Retention

Organizers

Co-chairs: Axelle Faughn(USA/NC) afaughn@email.wcu.edu

Barbara Pence(USA/CA) Barbara.Pence@sjsu.edu

Team Members: Mellony Graven(South Africa) m.graven@ru.ac.za

Glenda Anthony(New Zealand) g.j.anthony@massey.ac.nz

Claire Vaugelade Berg(Norway) claire.v.berg@uia.no

Liaison IPC Member: Oh Nam Kwon onkwon@snu.ac.kr

Aim & Rationale

This discussion group is designed to offer a comprehensive, multifaceted examination of the ongoing preparation, support and retention of mathematics teachers based on the results of research studies and contributions of the participants. It is hoped that discussions will enrich the dialogue relating the "support gap" and the work and retention of teachers of mathematics. It is also expected that this discussion group will propose areas ripe for further research by first identifying the gaps in the research on mathematics teacher retention in order to move forward in tackling this complex international issue.

At ICME 10, a Thematic Afternoon focused on Mathematics Teachers helped identify several questions that needed to be addressed to ensure adequate support of Mathematics Teachers' growth and development. The themes highlighted included retention and recruitment, professional development, and mathematics teacher identity. In our experience, the overarching issue

of mathematics teacher retention is often overlooked under the assumption that effective professional development would in essence lead to increased retention. However a closer look at what type of support helps teachers stay in their school, let alone their profession is necessary.

Although countries around the world face mathematics teacher shortages, there is little evidence in the literature that this global issue has received the attention it deserves from researchers. Within many countries national reports argue for the need to increase the pool of highly qualified mathematics teachers as a way to improve mathematics education and maintain economic competitiveness (e.g., National Academy of Sciences (2007) and Glenn Commission (2000) in the US; Brown (2009) in Australia; OECD, 2008 in South Africa; OECD, 2005 in the UK, Japan, Korea, France, others). Providing high quality mathematics education for all students goes beyond the recruitment of mathematically knowledgeable teachers to encompass issues of teacher support, professional development, and retention. Recent publications (e.g., Ingersoll (2011) in the U.S., Harris & Jensz (2006) in Australia) that claim retention as a key aspect of schools' staffing problems challenge the common beliefs that producing enough newly qualified teachers should sufficiently supply classrooms with qualified Math and Science educators.

Motivated by findings of attrition exceeding 50% of the mathematics teachers in the first five years of teaching, research on Mathematics Teacher Retention has received increased attention in the USA in recent years. Of urgent concern are the consistent research findings across studies that attrition and transfer most severely affect schools located in low income urban and rural communities. Recent research attempting to relate teacher effectiveness with retention found that some teacher attrition, especially if occurring in the first two years of teaching, might contribute to greater student learning outcomes, while cautioning that measures of teacher effectiveness can be difficult to establish (Boyd et al., 2009). In many countries these concerns are exasperated by the limited supply of Mathematics and Science teachers in comparison to other disciplines and the relative ease that Mathematics teachers have to transfer to non-educational professions.

Reasons for the lack of retention of new teachers and teachers in high-poverty schools are often related to "working conditions" and lack of support (Ingersoll, 2001; Smith & Ingersoll, 2004; Johnson et al., 2004; OECD, 2008), though pay also plays a role (Hanushek, Kain, & Rivkin, 2001). This support includes professional and collegial support such as working collaboratively with colleagues, coherent, job-embedded assistance, professional development, having input on key issues and progressively expanding influence and increasing opportunities (Johnson 2006). Preparation, support, and working conditions are important, because they are essential to teachers' effectiveness on the job and their ability to realize the intrinsic rewards that attract many to teaching and keep them in the profession despite the relatively low pay (Johnson & Birkeland, 2003; Liu, Johnson, & Peske, 2004). US data gathered by the National Center for Education Statistics with the School and Staffing Survey and the Teacher Follow-up Survey that examines mathematics teacher retention through the lenses of Magnitude, Destinations, and Determinants, claim that the provision of useful Professional Development is one of the organizational factors influencing Mathematics teachers decision to leave or remain in their positions. Another factor is the degree of individual classroom autonomy (Ingersoll & May, 2010).

Globally, efforts to support the learning and development of newly qualified teachers have seen a growth of targeted support and mentoring programs. Building on a range of research studies there is consensus that induction comprises an array of aligned and integrated components which include: carefully selected and trained mentors; a curriculum of intensive and structured support and professional development opportunities; regular meetings with mentors; opportunities to observe experienced teachers; formative assessment tools that permit evaluation of practice; and outreach to wider educational support. Moreover, there is now an increasing array of studies that evaluate the effectiveness of professional development in terms of teacher practice and student outcomes (Sztajn, 2011). How such interventions impact on teacher retention is less clear. Specifically for the beginning teacher, we know that even with mandated induction programs, access and quality of support vary by school (Anthony, Haigh, & Kane, 2011). Beyond the rates of participation and availability of support, there is the question of what is effective support. Schools need to be innovative in their approaches to induction, taking care to adapt policy guidelines to match individual teachers' levels of experience and preparedness, and to suit their situationally relevant context in terms of individual needs. For example, the increasing number of change-of-career teachers in some countries (Anthony & Ord, 2008) exemplifies the diversity of experiences and expectations that need to be addressed in terms of support.

The discussion will enable us to share current studies that are looking at such issues. For example, in a status report on teacher development focusing on Professional Development and support of teachers, Darling Hammond cites a large-scale research project which aims to measure the impact in terms of classroom practices, student achievement and teacher mobility (Darling-Hammond et al, 2009). Initial results seem to reflect the difficulty in identifying the impact of support. Establishing further controlled research is necessary to defend any conclusive results. Another study presently in its fourth year, Supporting Teachers to Increase Retention (STIR) is studying the relationship between retention and support of mathematics teachers across the state of California. This five-year study is looking through the lens of 10 sites with different support models to relate retention to content knowledge, classroom practices, professional communities of support, leadership and needed support. Initial results are complex

but are showing relationships between sustained professional development and support and teacher retention. Data collected to establish a base line for retention across a five-year period 2002-2006 preceding STIR shows that yearly attrition averaged 20% across all 10 sites. For the five-year period the attrition average was 54% with sites reporting an attrition of mathematics teachers as high as 73%. With intensive support, the yearly attrition showed a consistent yearly reduction from 20% to 14% to 6% across the 10 different professional development and support efforts. Case study research in South Africa similarly points to the importance of increasing teacher support in relation to retention. Graven (2004; 2005) indicates retention of mathematics teachers intending to exit the profession through the strengthening of mathematical professional teacher identities enabled through participation in a supportive 'community of practice'. At University of Agder (UiA), Norway, two substantial research projects (Learning Communities in Mathematics, LCM, and Teaching Better Mathematics, TBM) aimed at investigating how to enhance pupils' performance in mathematics by developing "communities of inquiry" including teachers from different schools (from primary to upper secondary) and researchers at UiA. Conducting these two developmental research projects helped establish and develop collaborative cooperation together with teachers and provided insights on the kind of challenges they met, in relation to their school's systemic aspects, while trying to implement "new ideas" in their current teaching practice.

We anticipate that the initial questions generated by the organizing team will stimulate the formation of a community that will collaboratively address the question of mathematics teacher retention and support. The product of the group will be two fold. First, there will be the establishment of a foundation for research including a set of guiding questions organized by dimensions that speaks across international situations, building of research agendas that address identified question and finally sharing of results, findings and challenges. Second, there will be the development of a community through which future attempts to tackle the serious and complex issues emerging through research efforts can be interpreted in light of accrued knowledge through collaboration. In preparation for beneficial discussions, the organizers will make extensive use of the ICME-12 website in order to provide participants with background information and research findings aimed at supporting the work of the group. Relevant contributions by interested participants will be invited and included in the program as well. In particular, the organizers will encourage contributions from researchers who can provide insights on mathematics teacher retention in Asian countries so as to help the group attain a more global perspective: if it is a problem there as well, how is it tackled in different cultures, and if retention is not a problem everywhere, then why not.

A final report that summarizes the main activities and principal findings of the group will be submitted for the conference proceedings.

Key Questions

The main question we try to address is whether professional development can have a positive effect on the retention of mathematics teacher, and if so what is the nature of professional development that leads to teacher retention and how (what are the mechanisms by which) such professional development supports teacher retention. However tackling the issue of Mathematics Teacher Retention requires looking at the problem through a variety of lenses. The following questions are categorized under main strands that will help discussion group participants to identify areas where their research emphasis may productively inform the debate.

The discussion group organizers are aware that we cannot expect to cover all issues listed below during the working group meeting times. However we wish to offer a large perspective on the issues pertaining to mathematics teacher retention in this initial proposal so that participants may decide what they want to engage with and which areas to discuss. This information will be collected through feedback on the ICME-12 website during the pre-conference exchanges.

1. Mathematics Content and Pedagogy, including Technology

- What aspects of mathematics content and pedagogical content knowledge contribute to teacher retention?
- What components of professional development contribute to the increase of mathematics content knowledge and/or pedagogical content knowledge of teachers?
- What components of professional development contribute to increase the cognitive level of mathematics presented to students? In other words, how do we ensure transfer to classroom practices?

2. Models of Support

- What role does support play in the development of new teachers and how might support be linked to retention/career pathways.
- What factors of support are effective for new teachers? Why are they effective?
- Are there dimensions of support that are more effective for teachers in urban schools? In rural schools? In schools with minority majority populations? What makes them more effective?

- How might forms of professional development work to deliberately develop strengthened professional mathematics teacher identities? What is the nature of practices and forms of participation made available to teachers that support the strengthening of these identities?
 - How might some existing models of support work to unwittingly undermine teacher professional identities and exacerbate teacher attrition?
 - How do we encourage school site and district administrators to support their new teachers?
3. Communities of Practice, including online and lesson study
- How do we build communities of practice both at the school level and at the local/regional level?
 - Do communities of practice emerge as a by-product of professional development or are they purposefully created?
 - What purpose and value do communities of practice bring to mathematics teachers?
4. Teacher Leadership
- What teacher leadership roles increase teachers' desires to stay in teaching?
 - In what way does teacher leadership increase teachers' desire to stay in teaching?
 - What challenges do teacher leaders face?
 - How do we create teacher leaders that focus on eliminating the learning gap?
 - How do we create teacher leaders that set high expectations of ALL students and ALL teachers?
 - How do we increase the number of teachers of color in leadership positions?
5. Research
- How are motivations to teach linked to expectations of career pathways?
 - What has been the impact of professional development programs that target mathematics teacher retention?
 - What research highlights the factors that contribute to the challenges of mathematics teacher retention?
 - What changes do mathematics teachers make in the classroom over time as a result of professional development that targets teacher retention?
 - How is teachers' professional development conceptualized in different research traditions? Which aspects of teachers' professional development are emphasized and which aspects are understated according to the chosen theoretical framework?
6. Policy
- What are the costs and benefits of teacher turnover?
 - What school or district policies need to be in place to increase the retention of mathematics teachers?
 - What are barriers to developing policies that support mathematics teacher retention?
 - What effective school and/or district policies provide the type of support teachers need to stay in teaching?
 - How might we develop policies that support and build understanding of the value of professional learning?
7. Mathematics Teacher Identity
- Is there a relationship between strengthened mathematical professional identities and teacher retention? If so what is the nature of this relationship?
 - In many countries teacher status is low and teachers are regularly positioned as those responsible for poor learner performance. How does an absence of professional status for teachers affect teacher retention?
 - How can professional development work towards strengthening professional identities?
 - How might research into teacher development sometimes be complicit in reinforcing the low status of teachers and undermine teacher professionalism?
 - Can research on Mathematics Teacher Identity provide a supporting lens to inform the relationship between professional development and mathematics teacher retention?

DG 12: Mathematics Teacher Educators' Knowledge for Teaching

Organizers

Co-chairs: Kim Beswick(Australia) kim.beswick@utas.edu.au

Olive Chapman(Canada) chapman@ucalgary.ca

Team Members: Merrilyn Goos(Australia) m.goos@uq.edu.au

Orit Zaslavsky(USA) oz2@nyu.edu

Liaison IPC Member: Gail Burrill burrill@msu.edu

Aim & Rationale

Much research in recent years has centred on the knowledge required by school teachers to teach mathematics. This has focused particularly on the roles of content and pedagogical knowledge and their interaction. The concept of pedagogical content knowledge (PCK) introduced by Shulman has received considerable attention in the mathematics education community and has been elaborated by Ball and colleagues in their extensive and influential work on Mathematics Knowledge for Teaching (MKT). In contrast, however, the knowledge required by mathematics teacher educators (i.e. mathematics educators who teach mathematics and/or mathematics pedagogy courses to teachers) has received relatively little attention but is an emerging field of research interest. A discussion group drawing on the latest research and thinking in the area is timely to set directions for future research in what is likely to be a growing and an important area of research in mathematics education. The aims of the discussion group are, therefore, to:

1. Facilitate discussion of key issues related to the knowledge required by mathematics teacher educators.
2. Identify different emergent strands in research that can be related to this area.
3. Summarise research and research/theoretical perspectives related to knowledge for mathematics teacher education.

Key Questions

The following three broad areas frame the territory of the discussion. These will be posted on the DG website and it is anticipated that they will evolve and/or be added to over the period leading up to ICME-12.

1. To what extent are the various knowledge types for mathematics teachers described by Shulman, Ball et al. and others applicable/transferable to mathematics teacher educators? How does the knowledge needed by mathematics teacher educators differ from that required by mathematics teachers? Is it a kind of meta-knowledge or something as distinct from the knowledge for teaching mathematics as knowledge for teaching science is?

The following three broad areas frame the territory of the discussion. These will be posted on the DG website and it is anticipated that they will evolve and/or be added to over the period leading up to ICME-12.

2. Who researches mathematics educators' knowledge? What are the dilemmas and opportunities associated with researching ourselves? What evidence is there of the knowledge required by mathematics teacher educators? What measures/criteria are there for successful mathematics teacher education and how are they connected to mathematics teacher educators' knowledge? What methodologies might be effective in building such an evidence base?
3. How is knowledge for mathematics teacher education acquired? How is the transition from mathematics teacher to mathematics teacher educator made and what is gained or lost in the transition? To what extent and in what ways is knowledge for teaching mathematics necessary for mathematics educators? What theories of learning are useful? What models are/should be used (e.g., apprenticeship, Generic tertiary teaching courses)?
4. Why might it be important to articulate knowledge for mathematics teacher educators? What contribution can understanding it make to our work and to mathematics education more broadly? Who wants to know about this knowledge and why?

DG 13: The Role of Mathematics Education in Helping to Produce a Data Literate Society

Organizers

Co-Chairs: William Finzer(USA) bfinzer@kcptech.com

Cliff Konold(USA) konold@srri.umass.edu

Team Members: Maxine Pfannkuch(New Zealand) pfannkuc@math.auckland.ac.nz

Michiko Watanabe(Japan) watanabe_michiko@nifty.com

Yuan Zhiqiang(China) zhqyuan@gmail.com

Liaison IPC Member: Yuriko Baldin yuriko@dm.ufscar.br, yuriko.baldin@uol.com.br

Aim & Rationale

Given that our global society now relies on vast quantities of data for nearly all aspects of its functioning, the general lack of preparation of students for working with data is a grave and growing concern. Mathematics educators, with their wealth of experience in quantitative thinking, bear special responsibility in helping to formulate and bring about the changes required to produce a data literate citizenry. In this discussion group we hope to understand the range of approaches to the situation in various countries, to arrive at some level of consensus on the proper role of mathematics educators in helping to solve the problem, and to formulate a strategy for mobilizing those who wish to work together on a solution.

Key Questions

1. What strengths do mathematics educators bring to bear on the problem? Conversely, with what aspects of the problem are mathematics educators unlikely to bring expertise?
2. What complementary roles can statistics educators and mathematics educators play in relation to improving data literacy?
3. What world-wide trends in the role of mathematics education in this area can we discover?
4. What should be the role of mathematics education in helping to produce a data literate society?
5. What steps should we propose be taken toward solution of the problem that are of special relevance to mathematics educators?

DG 14: Mathematical Modeling in Connecting Concepts to Real World Application

Organizers

Co-Chairs: Zhonghe Wu(USA) zwu@nu.edu

Lijun Ye(China) yeatsylj@126.com

Team Member: Shuhua An(USA) san@csulb.edu

Zhongxiong Fan(China) zhongxiongfan@163.com

Ling Wang(China) qiaosuanmei@126.com

Liaison IPC Member: Morten Blomhoej morten@ruc.dk

Aim & Rationale

In recent years, achieving mathematics proficiency has received notable attention (RAND, 2003; National Research Council [NRC], 2001). What useful, appropriate, practical, and effective strategies can be developed and used to enhance student proficiency in mathematics is still a puzzle to mathematics educators. This urgent need becomes a challenging task for mathematics educators seeking research-based strategies to support classroom teachers to enhance their teaching leading to student proficiency.

The Mathematical Modeling is a research-based teaching model (Lesh & Zawojewski, 2007; Niss, Blum, & Huntley, 1991) that builds conceptual understanding and problem solving skills. The mathematical modeling also reflects the core components of proficiency defined by research studies (Hill & Ball, 2004; NRC, 2001; RAND, 2003) --conceptual understanding, computational skills, problem solving, mathematical reasoning, and mathematical disposition.

This DG session will discuss the following questions.

Key Questions

1. What is Mathematics Modeling? Why Mathematics Modeling?
2. What is the relationship between mathematical modeling and mathematical proficiency? What does role of Mathematics Modeling play in teaching and learning mathematics for K-12 students?
3. How is mathematical modeling used in primary school?
4. How is mathematical modeling used in secondary school?
5. What are the challenges and issues of mathematical modeling in teacher professional development?

DG 15: Mathematics and Culture in Micronesia: An exploration of the mathematical aspects of indigenous practices

Organizers

Co-Chairs: A. J. (Sandy) Dawson(USA) dawsona@hawaii.edu

Donald Rubinstein(Guam) rubinste@uguam.uog.edu

Team Member: Joseph Zilliox(USA) zilliox@hawaii.edu

Neil Pateman(USA) pateman@hawaii.edu

Liaison IPC Member: Bill Barton b.barton@auckland.ac.nz, barton@math.auckland.ac.nz

Aim & Rationale

The aims of the discussion group are to (1) discuss the findings of the candidates investigations thus far, (2) explore the challenges and successes achieved in using elders to uncover and validate indigenous knowledge and practices (3) explore the pedagogical issues of how to translate the findings into materials and approaches suitable for elementary school children, and (4) consider implications for future research in other indigenous cultures. The discussion group will allow an exchange of ideas, successes, and challenges in supporting indigenous activities, capturing the mathematics contained therein, and preserving those activities and

the mathematics for future generations.

Key Questions

1. What mathematics has been uncovered in indigenous practices and activities of Micronesian peoples?
2. How can this mathematics and the associated practices be used to teach mathematics to indigenous children?
3. What are the challenges to conducting such research particularly working with elders and dealing with what, at times, is seen as 'protected' knowledge, and developing approaches to the teaching of mathematics with the focused populations?
4. What lessons can be learned from this work with indigenous populations?

DG 16: Can art save mathematics?

Organizers

Co-Chairs: Dirk Huylebrouck(Belgium) Huylebrouck@gmail.com

Slavik Jablan(Serbia) sjablan@gmail.com

Team Members: Jin-Ho Park(Korea) jinhopark@inha.ac.kr

Rinus Roelofs(The Netherlands) rinus@rinusroelofs.nl

Radmila Sazdanovic(USA) radmilas@gmail.com

Liaison IPC Member: Jaime CARVALHO E SILVA jaimecs@mat.uc.pt

Aim & Rationale

"Can art save the world?" is a well-known catchphrase in art circles. As most participants to the ICME are mathematicians, the title of this DG was reformulated more modestly as: "Can art save mathematics?" Indeed, some call mathematics a supreme art form as it enjoys total freedom, unrestricted by material limitations. An art form with the "collateral advantage" of having many real life applications, sure. However, if it can be considered as art, why don't art and mathematics more often collaborate, for their mutual benefit?

In the past, carpenters or painters sometimes helped mathematicians in the construction of mathematical models which sometimes had artistic ambitions(intarsia, for instance), but today's computers allow mathematicians to express themselves in total freedom, without the help of intermediate persons or tools. However, mathematicians aren't necessarily artists and so this technological improvement does not necessarily guarantee better art. Also, while in the past the lack of mathematical knowledge by artists was a burden for the development of mathematical art, today this should no longer be the case: computer developments make mathematics more accessible to artists, despite their usual aversion for the pure sciences. Yet how do we bridge the gap between mathematics and art so that mathematical art becomes an equally well "established" art field as, for instance, biological art or kinetic art? It would be beneficial for society because it would help to unite the "two cultures" of J.P. Snow, and because today's society needs designers interested in scientific developments.

Key Questions

- How much art should "artistic mathematicians" know in order to produce more than embellished mathematical results, so that their artistic mathematics are not mere "kitschy attempts"?
- How much mathematics should "mathematical artists" grasp in order to get really involved in the pure sciences, so that their mathematical art is not mere "baby math"?
- Or else, instead of turning mathematicians into 'artists' and artists into 'mathematicians', wouldn't it be better both sides simply cooperate – and if so, what should be the framework for such a collaboration?
- How can mathematics departments take mathematical art achievements into account in their output evaluation? For example, are mathematical art journals included in the journal rankings?
- How should the refereeing process work in this case where "peers" are by definition hard to find since the creative process implies every mathematical artwork should be unique? In the art world, refereeing is seldom done by peers.
- What is the difference between a scientific paper on mathematical art and a poetic artistic portrayal? The objectives of a purely mathematical paper are well known, but what about those of a paper on mathematical art?
- As for its implications in teaching mathematical art to art students, what are their specific needs and aspirations? The scientific "aha-Erlebnis" and "problem solving" are not sufficient, so how do we stimulate the creative mathematical approach?
- Is there a need for teaching mathematical art? The implications could be diverting students' attention from classical mathematics material (leading to "easy credit" courses). However, it could also raise awareness of the usefulness and the beauty of mathematics, inspiring students to continue
- taking math courses

DG 17: Teaching of Problem Solving in School Mathematics Classrooms

Organizers

Co-chair: Yew Hoong Leong(Singapore) *yewhoong.leong@nie.edu.sg*

Rungfa Janjaruporn(Thailand) *rungfajan@yahoo.com*

Team Members: Oh Nam Kwon(Korea) *onkwon@snu.ac.kr*

Tomas Zdrahal(Czech Republic) *zdrahal.tomas@gmail.com*

Masataka Koyama(Japan) *mkoyama@hiroshima-u.ac.jp*

Khiok Seng Quek(Singapore) *khiokseng.quek@nie.edu.sg*

Eng Guan Tay(Singapore) *engguan.tay@nie.edu.sg*

Foo Him Ho(Singapore) *foohim.ho@nie.edu.sg*

Tin Lam Toh(Singapore) *tinlam.toh@nie.edu.sg*

Liaison IPC Member: Masataka Koyama *mkoyama@hiroshima-u.ac.jp*

Aim & Rationale

The 1980s saw a world-wide push for problem solving to be the central focus of the school mathematics curriculum since the publication of Polya's book about solving mathematics problems in 1954. However, attempts to teach problem solving typically emphasised the learning of heuristics and not the kind of mathematical thinking used by mathematicians. There appears to be a lack of success of any attempt to teach problem solving within school curriculum. Problem solving strategies learned at lower levels tended to be ignored instead of being applied in their mathematical engagements at the higher levels, possibly because of the routine nature of the high-stake national examinations. The era of mathematical problem solving, its research and teaching and learning in schools ended, ambivalent on research findings and imprecise on recommendations for its teaching in schools (Schoenfeld, 1992; Lester 1994).

Based on the teaching and research experience of the organising team, we strongly feel that problem solving should still be the direction for teaching mathematics in schools. As such, this discussion group is proposed to identify the practices in teaching problem solving in school mathematics classrooms across different parts of the world, and how these practices are linked to the success.

Key Questions

1. What is the place of problem solving in the school mathematics curriculum?
2. How much curriculum time is spent in problem solving in comparison to the other components of mathematics curriculum?
3. What is the general perception on the importance of mathematical problem solving among the school teachers?
4. How (if any) is mathematical problem solving assessed?
5. How does a typical mathematical problem solving class look like (to provide a short video-clip if any).

Workshops and Sharing Groups

Workshops and sharing groups are either hands-on activities for a limited number of participants (20-40) who sign up ahead of time on the website of ICME-12 or small group activities designed to exchange and discuss relevant mathematical experiences. Workshops are targeted at a specific type of attendee, for example, teachers (from pre-school to university), graduate students, or researchers, who are interested in learning or trying out something through active participation. The workshops and sharing groups focus on experiences pertaining to research or teaching concerning a well-defined theme of common interest.

In workshops and sharing groups, no formal presentations will be made. Workshops and sharing groups should acquaint participants with, and provide experience in, a variety of areas, for example:

- an alternative/innovative approach to teaching or to classroom practice
- a non-traditional mathematical topic for the curriculum, or a non-traditional approach to a traditional topic
- a methodology or a technique in mathematics education research
- an innovative use of information and communication technologies in the service of mathematics education
- ways to read, write or assess academic papers in mathematics education
- how to initiate and conduct a research project
- obstacles, or avenues, to innovation experienced by individual teachers who want to adopt innovative approaches to teaching or assessment

- experiences of team teaching
- problems encountered in graduate supervision

Two sessions, one of 90 minutes and one of 60 minutes are provided for workshops and sharing groups. Workshops and sharing group organizers can use either one or both of these slots for their activities. A few rooms equipped with computers for running computer based workshops will be available upon request from the organizers.

Proposals for workshops and sharing groups in English, Korean, Chinese, or Japanese may be submitted on line by individuals or groups at the ICME-12 website. Proposals must include information about the background of the proposers, a title that specifies the nature of the activity, either a workshop or a sharing group, with a clear description of the theme, the target audience, the ideal number of participants, the goals of the activity and needs for equipment or special room space. Please check the Submission of proposals page for instructions.

Proposals should be received no later than November 30, 2011 for review by IPC chair, and the decision will be posted on the same web site by 31 December 2011. Approved proposals will have a web page in the ICME 12 web site at their disposal to present their workshops, and sharing groups and will be listed in the final program. Please note that participation in workshops or sharing groups is limited and allocated on a "first come first served" basis.

Deadline Summary

November 30, 2011 On-line submission of proposal

December 31, 2011 Notification of acceptance

April 10, 2012 On-line submission of Final paper and description of programme items

Posters

Participants are invited to submit presentations in the form of posters at ICME-12. Topics and initiatives in mathematics education research or practice are possible themes for poster presentations. Posters may be presented in any of the four languages: English, Korean, Chinese and Japanese.

The exhibition space for posters can accommodate several hundred posters and will be highly accessible and well-located in central areas of the Congress activity. Posters will be on display for two or more days of the Congress. Time slots will be allocated for presentations, and authors must choose one of the two modes of presentation, oral presentation or Round Table Discussion. Oral Presentation and Round Table Discussions will be listed in the final program for ICME-12. The IPC will appoint experienced mathematics educators to chair the Round Table Discussions.

The posters and the presentations will be grouped, as far as possible, according to language and according to the themes of the 37 Topic Study Groups. Although this is optional, authors are invited to indicate the Topic Study Group that their poster most closely relates to. Posters connected to Topic Study Groups will potentially have the benefit of an audience related to the TSG.

Information about the size and format of posters will be given when a poster has been accepted, and will be posted on the 'Poster Presentations' webpage. Presenters should use a font of at least 24 points so as to make the posters readable at a distance of 1.5 meters. Poster presenters should consider using both textual and visual means of presentation in their posters. The congress will not be able to provide poster supplies or material on site beyond space and adhesive tape.

Authors proposing to present posters need to complete an online form, submit an abstract of the poster written in text form of 300 to 500 words and include a title and keywords before 15th December 2011. The abstracts need to be in English even if the poster is to be presented in another language.

Deadline Summary

December 15, 2011 On-line submission of proposal

January 15, 2012 Notification of acceptance

April 10, 2012 On-line submission of Final description of WSG program

Affiliate Organizations (AO)

The ten Organizations officially affiliated to ICMI are allocated two one and half hour timeslots (Wednesday and Friday, 17:00-18:30) for their meetings during ICME-12. These Affiliate Organizations are either affiliated study groups or multinational societies.

The six affiliated study groups:

HPM (International Group for the Relations between the History and Pedagogy of Mathematics)

Official home-page: www.mathedu-jp.org/hpm/index.htm

The HPM satellite conference will be held subsequent to ICME-12 on July 16-20 in Daejeon, Korea.

ICTMA (International Community of Teachers of Mathematical Modeling and Applications)

Official home-page: www.ictma.net

IOWME (International Organization of Women and Mathematics Education)

Official home-page: www.stanford.edu/~joboaler/iowme/index.html

MCG (International Group for Mathematical Creativity and Giftedness)

Official home-page: <http://www.igmcg.org/index.html>

The MCG conference will be held subsequent to ICME-12 on July 15 - 18 in Busan, Korea.

PME (International Group for the Psychology of Mathematics Education)

Official home-page: www.igpme.org

The 36th PME conference will be held subsequent to ICME-12 on July 18-22 in Taipei, Taiwan.

WFNMC (World Federation of National Mathematics Competitions)

Official home-page: www.amt.canberra.edu.au/wfnmc.html

The WFNMC mini- conference will be held before ICME-12 on July 15 in COEX

The four affiliated multinational societies:

CIAEM-IACME (Comité Interamericano de Educación Matemática - Interamerican Committee on Mathematics Education)

Official home-page: <http://www.cimm.ucr.ac.cr/ciaem>

CIEAEM (Commission Internationale pour l'Étude et l'Amélioration de l'Enseignement des Mathématiques; International Commission for the Study and Improvement of Mathematics Teaching)

Official home-page: <http://www.cieaem.net/index.htm>

ERME (European Society for Research in Mathematics Education)

Official home-page: <http://ermeweb.free.fr/>

MERGA (Mathematics Education Research Group of Australasia)

Official home-page: <http://www.merga.net.au/>

ICMI Studies & Klein Project

The set of ICMI studies was launched in the mid-80s and has acquired a growing importance and influence on the field. These study volumes have contributed to a better understanding and resolution of the challenges that face multidisciplinary and culturally diverse research and development in mathematics education. Each Study focuses on a topic or issue of prominent current interest in mathematics education. Built around an international conference, a study is directed towards the preparation of a published volume intended to promote and assist discussion and action at the international, regional or institutional level. The main emphasis of a given Study may be on analytical or action-oriented aspects, but some analytical component will always be present.

The Klein Project is inspired by Felix Klein's famous book *Elementary Mathematics from an Advanced Standpoint*, published one century ago. It is intended as a stimulus for mathematics teachers, so to help them to make connections between the mathematics they teach, or can be asked to teach, and the field of mathematics, while taking into account the evolution of this field over the last century. The project will have three outputs: a book simultaneously published in several languages, a resource DVD to assist teachers wishing to bring some of the ideas to realization in their classes, and a wiki-based web-site seen as a vehicle for the many people who will wish to contribute to the project in an on-going way.

ICMI Study 18 Statistics Education in School Mathematics : Challenges for teaching and teacher education

ICMI Study 19 Proof and Proving in Mathematics Education

ICMI Study 20 Educational Interfaces between mathematics and industry

ICMI Study 21 Mathematics Education and Language Diversity

Klein Project

Mathematical Carnival

As a part of the program directed towards children and general public, the LOC of ICME-12 will arrange a mathematical carnival during the conference days of ICME-12. The idea is that this will attract local families, teachers and families of participants as a way to experience mathematical activities. The carnival will be located at the conference center. Each booth will have a different theme, and the booths will be organized as a journey through different worlds of mathematics.

The themes are:

- Playing with mathematical puzzles and games
- Mathematics around the world
- Computer and mathematics
- Exhibition of Mathematical Art
- Exhibition of Mathematics Manipulatives
- Mathemagic
- Mathematics in daily life
- Mathematical Workshops for various students and a general public

The activities will be organized so that some children or those from the general public engage directly in an activity and become a part of the performance, while other people will be the audience. The equipment used should be of a size that makes it visible for everyone inside the booth. If it is possible, contributors themselves are asked to bring the equipment needed for their show. Instructions for the activities should be written in English on one page, and if possible, in Korean on the other side of the instruction sheet.

LOC also calls for mathematical clowns and jugglers! Late afternoons and evenings will be aimed at older children and adults. Here we will engage mathematicians in giving popular talks for a general audience. LOC invites teachers from all countries to contribute and participate in the carnival activities. These should be activities that have been tried out with students in class, at mathematics fairs or other events aimed at engaging children in active participation. In this way we, mathematics educators, will also have a chance to show how a variety of novel activities might be used as a tool for learning mathematics while having fun.

OFFICIAL MEETINGS



General Assembly of ICMI

ICMI will hold its General Assembly (GA) on Sunday, July 8, 2012, all day. The election of the ICMI Executive Committee (EC) for the period 2013-2016 will then take place. Time and location will be announced later.

Meetings

Groups and bodies within the community of mathematics education are invited to hold business meeting during the congress. Please send your requests for such meetings to LOC via e-mail (mail to: hclew@knue.ac.kr) as soon as it is convenient, before January 20, 2012, with information regarding the estimated number of participants. Meetings will be scheduled 15:30-16:30, Friday so there are no incompatibilities with major activities.

GRANTS FOR PARTICIPANTS



One of the aims of the ICME congresses is to have a balanced representation from all over the world among the presenters as well as among the general participants. In order to achieve this goal ICMI has instigated a general policy of forming a solidarity fund established by setting aside 10% of the registration fees for grants. These grants assist delegates from the developing countries to attend the ICMEs.

An autonomous and anonymous Grants Committee, appointed by the ICMI Executive Committee, will distribute the funds amongst the successful applicants. Priority will be given to applicants from non-affluent countries who contribute to the scientific program and to participants who are expected to be the only representative from their part of the world.

Grants will be given as partial support to registration fee, accommodation, meals and/or travel costs. All potential applicants are advised to apply for funding from other sources as well.

Application for an ICME-12 grant

Participants who consider themselves eligible for an ICME-12 grant are encouraged to send a grant application to the Grants Committee. Applications should be sent as soon as possible and so that they are received no later than February 15, 2012.

The application form can be downloaded at the web site(www.icme12.org) or find it at the end of this announcement. Please send the form via e-mail(Prof. Sung Je Cho).

Professor **Sung Je Cho**
Chair of IPC
Department of Mathematics Education
Seoul National University
sungjcho@snu.ac.kr

Applicants will be informed of the Grants Committee's decision no later than March 1, 2012.

ICMI AWARDS



The Executive Committee of the International Commission on Mathematical Instruction (ICMI) has created two awards in mathematics education research:

- The Hans Freudenthal Award, for a major program of research on mathematics education during the past 10 years.
- The Felix Klein Award, for a lifelong achievement in mathematics education research.

These awards consist of a certificate and a medal, and they are accompanied by a citation. They have a character similar to that of a university honorary degree, and they are given in each odd numbered year. At each ICME, the medals and certificates of the awards given after the previous ICME are presented at the Opening Ceremony. At the opening ceremony of ICME-12, four ICME awards will be formally presented: the Felix Klein and the Hans Freudenthal 2009 and 2011 awards.

ICME-12 Poster

<http://icme12.org>

ICME-12

The 12th International Congress on Mathematical Education

July 8th to 15th, 2012
COEX, Seoul, Korea

Cheomseongdae, a bottle-shaped building, was built in 647 and was used as an astronomical observatory. The tower is built out of 362 pieces of cut granite which some claim represent the 362 days of the lunar year. 12 layers are below the window level, and 12 layers are above. These set of stones may symbolize the 12 months of the year. The combined shape of square and circle which symbolize the ground and sky respectively shows the beauty of harmony. It is located in Gyeongju which was the capital of the Silla Kingdom for a thousand years.

ICME-12
2012
KOREA

International Commission on Mathematical Instruction

Description of Background:

The configuration of orthogonal Latin squares of order 9 appeared in "Ku-su-ryak" written by Korean mathematician Choe S'ok-ch'ong (1646-1715), at least 67 years prior to Euler's paper written in 1776.

Source: Mathematics Magazine, Volume 83, Number 3, June 2010, pp. 163-167(5)

TIME	Sun	Mon	Thu	Wed	Thur	Fri	Sat	Sun	TIME		
8:00	GENERAL ASSEMBLY	Registration	Registration						8:00		
8:30									8:30		
9:00		Opening Ceremony	Plenary III	Plenary IV		Plenary VI (Panel)	Plenary VII	Plenary VIII	9:00		
9:30			9:30								
10:00			Coffee Break	Coffee Break			Coffee Break	Coffee Break	10:00		
10:30			TSG I	TSG II		Coffee Break	TSG IV	RL VI	10:30		
11:00										11:00	
11:30			Coffee Break			TSG III		Moving Break	11:30		
12:00		Plenary I	Lunch Break/ Exhibition	Lunch Break/ Exhibition	Lunch Break/ Exhibition		Closing Ceremony	12:00			
12:30											12:30
1:00		Lunch Break/ Exhibition	RL II	RL III	Lunch Break/ Exhibition	RL V	Farewell Gathering	1:00			
1:30											
2:00						RL IV		2:00			
2:30		RL I	Moving Break	Moving Break			Moving Break		2:30		
3:00			Moving Break	NP	Plenary V (Panel)		Survey Teams		3:00		
3:30								Meetings	WSG		3:30
4:00		Plenary II	Coffee Break	Coffee Break		Coffee Break	Coffee Break		4:00		
4:30											
5:00		Coffee Break						5:00			
5:30		ICMI Studies + Klein	NP	DG	AO	WSG	AO	Poster RT	DG	Poster RT	5:30
6:00	Welcome Reception									6:00	
6:30			Happy Hour	Happy Hour		Happy Hour	Happy Hour		6:30		
7:00		Happy Hour							7:00		
7:30									7:30		
8:00									8:00		
8:30		Registration	Registration						8:30		
9:00	9:00										



ACCOMMODATION

Please find a wide selection of hotels located near subway stations of Seoul Metro.

- The Local Organizing Committee is pleased to offer you a special discount rate for some hotels: "Grand Intercontinental Hotel", "Imperial Palace", "Renaissance Seoul", "Ellui Hotel", "Ramada Hotel", "Riviera Hotel", "Ibis", "Artnouveau City", "Casaville Samseong", "Seoul Residence", "Seoul National University" and "Kunkuk University". If you would like to stay at above hotels, you should make a reservation through the ICME-12's official accommodation agency to get a special discount rate. The rates, however, are subjected to change without notification. If you book directly with the hotels, the price might not coincide with the offered below depending on the reservation date and contract option. Please visit the website(www.icme12.org) for the detailed.
- 10% Service Charge and 10% VAT will be added to all Hotel's price. Exchange rate is subjected to daily fluctuation, but currently 1 EURO = 1,600 W, 1 US\$ = 1,100 W.
- If you have any question, please contact the ICME-12 Secretariat via email(icme12@icme12.org).
- Time(Min.): from the hotel to the COEX by subway.

Hotel Name	Class	Price(KRW)	Subway Line	Subway Station	Time (Min.)	Home Page	Hotel No.
Imperial Palace	Super Deluxe	160,000	7	Nonhyeon	41	http://www.imperialpalace.co.kr	2
Renaissance Seoul	Super Deluxe	180,000	2	Yeoksam	9	http://www.marriott.com	3
Grand Intercontinental	Super Deluxe	230,000	2	Samseong	5	http://www.seoul.intercontinental.com	1
Ellui Hotel	Deluxe	110,000	7	Chungdam	36	http://www.ellui.com	4
Ramada Hotel	Deluxe	150,000	2	Samseong	5	http://www.ramadaseoul.co.kr	5
Riviera Hotel	Deluxe	150,000	7	Chungdam	36	http://www.hotelriviera.co.kr	6
Euljiro Co-op Residence	Residence	80,000	2	Dongdaemun	43	http://rent.co-op.co.kr	76
Hyundai Residence	Residence	85,000	2	Euljiro4(sa)-ga	39	http://www.hyundairs.com	77
Seocho Co-op Residence	Residence	100,000	2	Seoul National Univ. of Education	17	http://rent.co-op.co.kr	75
Western Co-op	Residence	110,000	3	Dongdaemun	43	http://rent.co-op.co.kr	48
Artnouveau City	Residence	150,000	2	Samseong	10	http://www.artnouveau-city.co.kr	8
Casaville Samseong	Residence	150,000	2	Samseong	10	http://www.casavillesamsung.co.kr	9
Seoul Residence	Residence	150,000	2	Seolleung	10	http://www.seoulresidence.kr	10
Seoul National University	Dormitory	17,000	2	Nakseongdae	26		11
Kunkuk University	Dormitory	66,000	2	Konkuk Univ.	25		12
Boom	Tourist	50,000	5	Balsan	69	http://www.hotelboom.com	39
Atnoon Hotel	Tourist	50,000	2	Sinchon	55	http://www.atnoonhotel.com	42
Kaya Hotel	Tourist	53,000	1	Namyong	57	http://www.kayahotel.net	27
J Hotel	Tourist	55,000	2	Yeoksam	14	http://www.jhotel.co.kr	61
Toyoko Inn Seoul	Tourist	55,000	2	Dongdaemun	43	http://www.toyoko-inn.com	74
Arego Hotel	Tourist	60,000	7	Gangdong	25	http://www.argohotel.co.kr	38
Best Western Vision Hotel	Tourist	60,000	2	Wangsimni	32	http://www.hotelvision.co.kr	43
Hotel Skypark	Tourist	60,000	4	Myungdong	44	http://www.skyparkhotel.com	58
Jamsil Hotel	Tourist	65,000	2	Shincheon	14	http://www.jshotel.co.kr	25
East Seoul Hotel	Tourist	66,000	2	Gangbyeon	21	http://www.idshotel.co.kr	18
Dongwha Kims Hotel	Tourist	70,000	3	Gyeongbokgung	50	http://www.kimshotel.co.kr	16
Victoria Hotel	Tourist	70,000	4	Miasamgeori	54	http://www.hotelvictoria.co.kr	35
Circle Hotel	Tourist	70,000	2	Hapjung	51	http://www.circlehotel.co.kr	40
Hawaii Hotel	Tourist	70,000	2	Samseong	5	http://www.hotelhawaii.co.kr	51
Amourex Hotel	Tourist	80,000	2	Wangsimni	32	http://www.amourexhotel.com	37
Biwon Hotel	Tourist	80,000	1, 3	Jongro3(sam)-ga	44	http://www.biwonhotel.com	44
Seoul YMCA Hotel	Tourist	80,000	1	Jonggak	53	http://www.ymca.or.kr	72

Hotel Seoul Leisure	Tourist	81,000	6	Yeonsinnae	63	http://www.slhotel.co.kr	24
Namkung Hotel	Tourist	85,000	2	Hapjung	52	http://www.nkhotel.com	64
Hill House Hotel	Tourist	88,000	4	Hoehyeon	46	http://www.hillhouse-hotel.com	52
California Hotel	Tourist	88,300	2	Yeoksam	14	http://www.californiahotel.co.kr	45
Hotel Green World	Tourist	90,000	5	Deungchon	62	http://www.hotelgreenworld.co.kr	23
R Hotel	Tourist	90,000	1	Youngdeongpo	51	http://www.r-hotel.co.kr	31
Human Starville	Tourist	90,000	2	Yeoksam	14	http://www.humanstarville.com	59
IMI Hotel	Tourist	90,000	2	Yeoksam	14	http://www.imihotel.co.kr	60
T Ria Hotel	Tourist	90,000	2	Yeoksam	14	www.triahotel.co.kr	73
Han River Hotel	Tourist	98,000	5	Gwangnaru	36	http://hankanghotel.co.kr	20
Karak Hotel	Tourist	98,000	3	Garak Market	29	http://www.hotelkarak.com	26
Nobless Hotel	Tourist	98,000	4	Nowon	57	http://www.hotelnoblesse.co.kr	29
River Park Hotel	Tourist	99,000	9	Yeomchang	60	http://www.riverpark.co.kr	33
Metro Hotel	Tourist	99,000	2	Euljiro Entrance	42	www.metrohotel.co.kr	63
New Kukje Hotel	Tourist	100,000	2	City Hall	44	www.newkukjehotel.com	65
Lake Hotel	Tourist	105,000	2	Jamsil	16	http://www.hotellake.co.kr	28
Hamilton Hotel	Tourist	108,900	6	Itaewon	54	http://www.hamilton.co.kr	19
Hotel Provista	Tourist	115,000	2	Seoul National Univ. of Education	17	http://www.provista.co.kr	57
ADLIGE Hotel	Tourist	120,000	2	Yeoksam	14	http://www.adlige.co.kr	41
Dynasty Hotel	Tourist	121,000	9	Sinnonhyeon	39	http://www.hoteldynasty.co.kr	17
New Seoul Hotel	Tourist	125,000	2	City Hall	44	http://www.bestwesternnewseoul.co.kr	66
Pop Green Hotel	Tourist	126,000	3	Apgujung	34	http://www.popgreenhotel.com	30
Hotel Acacia	Tourist	130,000	3	Dongdaemun	43	http://www.hotelacacia.co.kr	21
Yoido Hotel	Tourist	130,000	5	Yeouinaru	57	http://www.yoidohotel.co.kr	36
Seogyo Hotel	Tourist	132,000	2	Hongdae	53	http://www.hotelseokyo.co.kr	34
Dormi Inn Seoul Hotel	Tourist	132,000	2	Yeoksam	14	http://www.dormy.co.kr	46
Olympic Parktel	Tourist	139,700	8	Mongchontoseong	25	http://www.parktel.co.kr	67
Rex Hotel	Tourist	140,000	4	Hoehyeon	46	http://hotelrex.co.kr	32
Hotel Capital	Tourist	140,000	6	Noksapyeong	53	http://www.hotelcapital.co.kr	53
Sejong Hotel	Tourist	140,000	4	Myungdong	44	http://www.sejong.co.kr	70
Blue Pearl Hotel	Tourist	143,000	7	Cheongdam	36	http://hotelbluepearl.com/English	14
Hotel President	Tourist	143,000	2	City Hall	44	http://www.hotelpresident.co.kr	55
Hotel Prince	Tourist	143,000	4	Myungdong	44	http://www.princehotel.co.kr	56
Savoy Hotel	Tourist	145,000	4	Myungdong	44	https://www.savoyhotel.co.kr	69
Crown Hotel	Tourist	147,000	6	Noksapyeong	53	http://hotelcrown.com	15
Pacific Hotel	Tourist	148,600	4	Myungdong	44	http://www.thepacifichotel.co.kr	68
Ibis	Tourist	150,000	2	Samseong	10	https://ibis.ambatel.com	7
Best Western Hotel	Tourist	155,000	2	City Hall	44	http://www.bestwesterngangnam.com	13
Hotel Air Port	Tourist	160,000	5	Songjung	72	http://www.hotelairport.co.kr	22
Hotel Irene	Tourist	160,000	2	City Hall	44	http://www.hotelirene.co.kr	54
Lotte City Hotel	Tourist	160,000	5	Gongduk	55	http://www.lottcityhotel.co.kr	62
Gangnam Coatel Cherville	Tourist	165,000	2	Gangnam	15	http://www.coatel.co.kr	50
Seoul Royal Hotel	Tourist	170,000	4	Myungdong	44	http://www.royal.co.kr	71
Eastgate Tower Hotel	Tourist	190,000	2	Dongdaemun	43	http://www.eastgatehotel.kr	47
FRASER PLACE Hotel	Tourist	209,000	2	City Hall	44	http://www.fraserplace.co.kr	49

Homestay

The Local Organizing committee is planning to provide a homestay program which hosted by Korean mathematics teachers. Detailed information will be announced soon.



EXCURSIONS



The excursion is scheduled for Thursday, July 12th, and basically there is no additional charge for it except some programs. The excursion aims at showing congress participants and their accompanying persons the dynamics metropolitan Seoul, its natural beauty and cultural abundance. The choice of excursion programs should be indicated on registration process on-line no later than April 1, 2012. Please note that all programs are first come first served.

All excursions may be subject to changes.

- All programs include transportation, a lunch and a tour guide except Course 13 and 14..
- Course 13 and 14 are not free and at the following table have to be paid at the registration site.
- Please visit the congress website (www.icme12.org) for more information.

Date & Time

09:00~16:00, July 12, 2012

Programs

Course		Program
Course 0		Visit a school ¹⁾
Old Seoul- Korea's traditional & Cultural visit ²⁾	Course 1	Pass By The Presidential Blue House (Cheongwadae Sarangchae) ⇒ The Royal Guard Changing Ceremony ⇒ Kyungbok Palace ⇒ The National Folk Museum ⇒ Lunch ⇒ Insadong ⇒ Namdaemun Market
	Course 2	Gwanghwamun Square ⇒ The story of King Sejong & Ammiral Yi Sunshin ⇒ Changdeok Palace ⇒ Lunch ⇒ Namsan Hanok Village ⇒ Dongdaemun Market
Modern & Old Seoul<Gangnam> - Combination of Korea's traditional culture & Modern culture ³⁾	Course 3	Bongeun Temple ⇒ Kukkiwon ⇒ Lunch ⇒ Seongjeong Royal Tomb
	Course 4	Yangjae Citizens' Park ⇒ Samsung Dlight ⇒ Gangnam ⇒ Lunch ⇒ Apgujeongdong ⇒ Sinsadong Garosugil Road
Korean war history and the reality of partition ⁴⁾	Course 5	Imjingak Park ⇒ DMZ theater & exhibition hall ⇒ The 3rd Infiltration Tunnel ⇒ Dora Observatory ⇒ Dorasan Station ⇒ Lunch ⇒ Heyri Village
	Course 6	Odusan Unification Observatory ⇒ Lunch ⇒ The War Memorial of Korea ⇒ Itaewon
Another sight of Gangbuk ⁵⁾	Course 7	Bukak Skyway ⇒ Deoksugung Palace ⇒ The Royal Guard Changing Ceremony(Deoksugung) ⇒ Lunch ⇒ Daehangno (University Street) ⇒ Hwanghakdong Flea Market
	Course 8	Digital Pavilion ⇒ World Cup Stadium ⇒ Lunch ⇒ Sky park ⇒ Insadong ⇒ Hongdae (Hongik University Street)
Experiencing Tour ⁶⁾	Course 9	Trying a Hanbok & Learning Korean Manners, Traditions ⇒ Lunch ⇒ The National Museum ⇒ Itaewon
	Course 10	Practice in Kimchi Cooking. ⇒ National Palace Museum of Korea ⇒ Lunch ⇒ Seoul History Museum ⇒ Gyeonghuigung(palace)
back to the 1930s ⁷⁾	Course 11	Bukchon Hanok Village ⇒ Samcheong dong gil(street) ⇒ Lunch ⇒ Seodaemun Prison History Hall ⇒ Dongnimmun Gate
	Course 12	Samcheong dong gil(street) ⇒ Bukak Skyway ⇒ Waryong Park(Fortress Wall) ⇒ COEX
Kyungju ⁸⁾	Course 13	Seoul Station ⇒ Kyungju Station ⇒ Cheonmachong Tomb ⇒ Seokguram temple ⇒ Bulguk Temple ⇒ Anapji Pond ⇒ Kyungju Station ⇒ Seoul Station
Entertainment & Shopping ⁹⁾	Course 14	Lotte World

¹⁾ "You will have an opportunity to visit an elementary, junior high and senior high school."

²⁾ Joseon Dynasty, the 500 years long dynasty and also the longest ruling Confucian dynasty in the world, shows off classical and splendid Korean culture, trade, science, literature, and technology. You will discover the historic beauty of Korea by Korea's most beautiful royal palace, street/market fulfilled with diverse genres of arts and antiques, and traditional Korean houses.

³⁾ You can meet the cradle of modern Korean Buddhism in the temple and experience royal tomb of King and Queen which is in harmony with nature. You may enjoy modern fashion and beauty in Gangnam and Apgujeongdong. Do not miss the booming nightlife!

⁴⁾ DMZ, an area fulfilled with iconic reminders of the tragedy of war, will bring you a special experience regarding war and peace. On the other side, you will be attracted by Itaewon, a home for the majority of expats that reside in Korea, serving as a mini melting pot of culture and religion for all over the world.

⁵⁾ Gangbuk, located in the North of Seoul, has various historic attractions and local cultural facilities for visitors. You can expect many historical scenes such as royal guard changing ceremony. You will see the energetic lifestyle of Korean.

⁶⁾ There are a variety of activities such as making Korean food and trying Korean traditional dress. There are programs which help you experience the authentic culture of Korea's royal palaces. These activities and programs will help you fully experience the heart of Korean culture.

⁷⁾ 'Bukchon' is a hanok (traditional Korean house) village where nobles of the Joseon Dynasty used to live in. Nowadays, some of the 900 hanoks are still used

as houses, whereas others are changed into shops, galleries, studios, etc. This area is hailed as a cultural arts district. Specifically, Samcheong-dong is famous for its high-class style where you can find designer shops and exotic galleries that fill the neighborhood with an artistic flavor. You can also find elegant restaurants and cafes here that shouldn't be missed.

⁸⁾As the capital of the Silla Kingdom for almost a thousand years, Gyeongju preserves vast amount of significant and fascinating historical heritages. Along with Bulguksa Temple and Seokguram Grotto, the Gyeongju historical district has been designated as a World Heritage by UNESCO. Due to the bountiful historical, natural, and cultural attractions, this region has long been a major tourist destination in Korea.

⁹⁾Located in the heart of the city, Lotte World is the perfect spot for entertainment and sightseeing. It is a theme park filled with thrilling rides, an ice rink, different kinds of parades as well as a folk museum, a lake, and much more. There are also Lotte Department Store and Duty Free shop near the Lotte World.



REGISTRATION

Registration is available at ICME-12 registration webpage. Registration is valid only when accompanied by confirmation of payment.

Note: 10% of the registration fee is directed to the Solidarity Fund. Further contributions are welcome and can be indicated upon registration.

Registration Fee

General	USD400	USD450	USD500
Participant of HPM or MCG to be held in Korea, 2012	USD320	USD360	USD400
Accompanying Person		USD130	

Special Discount Rate

Those who are register at ICMI satellite conferences MCG(The International Group for Mathematical Creativity and Giftedness) or HPM(International conference for History and Education of Mathematics) to be held in Korea will have a 20% discount off registration fee for ICME-12.

To have this special discount rate, you should register at the conferences MCG or HPM first. Once your registration is clear at these conferences, you can have a discounted rate for ICME-12. You are requested to upload a receipt or confirmation letter for MCG or HPM when you register at ICME-12.

Registration fee for participant includes:

- A set of Final Program and abstracts booklets
- Admission to scientific program activities
- Admission to exhibition area
- Excursion of your choice for Thursday, July 12th (lunch included)
- A USB memory stick containing all kinds of scientific activities
- Admission to social program activities
- One CD of ICME-12 proceedings, to be published after the congress(except shipping charge)

Registration Fee for accompanying persons

- Admission to exhibition area
- Excursion of your choice for Thursday, July 12th (lunch included)

Method of Payment

Payment can be made either through credit card or bank transfer.

Credit card

A participant paying with a credit card may register on-line. Visa, Master and JCB are accepted.

Bank transfer

- Payment of registration fees by bank transfer will not be accepted after 15 June 2012.
- All bank charges must be borne by the delegate and should not be deducted from the total amount remitted.
- All bank transfer must be clearly marked with the delegate's name. If otherwise, please let the secretariat know it.
- A copy of remittance receipt should be faxed or emailed to the Secretariat. Direct bank transfers should be made to the account below:

Oversea

- Bank Name: National Agricultural Cooperative Federation (NH Bank)
- Account Number: 452-0003-9988-51
- Beneficiary : ICME-12 (The 12th International Congress on Mathematical Education)
(Address: Korea National Univ. of Education Gangnae-myeon, Cheongwon-gun, Chungcheongbuk-Do, Seoul, 363-791, Korea /
Tel: +82-43-230-3721)
- Swift Code: NACFKRSE

Korean

- 은행명: 농협
- 계좌번호: 301-0040-1389-01
- 예금주: 제12차 국제수학교육대회조직위원회

Confirmation Letter

A automatic confirmation letter will be sent to you upon completion of registration by e-mail. You may also download the receipt at "My Page" after logging into the online registration system.

Cancellation of Registration

Cancellation of registration should be notified in writing (e-mail or fax) to the Secretariat. Please note that all refunds will be processed after the Congress for administrative reasons. All cancellations made before June 1st will incur a cancellation fee of 20% of the amount paid. Cancellations after this date will not be possible. If the congress is cancelled for reasons beyond the control of the organizers, the registration fee will be refunded after deduction of expenses related to the handling of the registration.

Visa

The Secretariat will issue a letter of invitation upon request for participants who are obliged to acquire a visa. Visa fees or any relevant expenses are to be borne by the delegate. To receive a letter of invitation, delegates must complete the registration process. In case the visa is not granted, full registration fee will be refunded. Please contact the Secretariat if any problem arises. Visa requirements vary from one country to another in the Asia and the Pacific region. It is the sole responsibility of the delegates to acquire a visa.

* To request a letter of invitation, please send the invitation request form after filling it out and a copy of passport to the secretariat by e-mail or fax.

GENERAL INFORMATION



Congress language

The official congress language is English. Nevertheless, simultaneous translation to Korea, Japanese and Chinese will be provided for the plenary activities.

Visa

All participants must find out if they need a visa to enter Korea. Guidelines for obtaining a visa can be found in the <http://www.mofat.go.kr/english/main/index.jsp>

Letter of invitation

Upon request, a letter of invitation will be sent to speakers and contributors to scientific program activities for visa purposes or if required by their institution. Other participants who need a letter of invitation are asked to send official documentation of their professional affiliation with Mathematics Education via E-mail(icme12@icme12.org) so that we may honor their request.

Health insurance

Congress participants should make sure that their health insurance will cover their travel and stay in Korea. Your insurance agent should be able to provide this information.

Weather

In July you may expect bright sunshine and scattered showers in Seoul. For the period of July 8 to 15 in recent years, the weather in Seoul has had a mean temperature of 24°C, with an average high of 28°C and an average low of 21°C. It is very hot and humid.

Tourist Information

Further tourist information about Korea and Seoul can be found at:

<http://www.visitkorea.or.kr/intro.html>

<http://www.visitseoul.net/main.jsp>

PUBLIC SUPPORTING BODIES



The ICME 12 organization is happy to thank for their important support in many ways the following organizations and public bodies:

Korea Association of Mathematics Societies

Korean Mathematical Society

Korea Society of Mathematical Education

Korea Society of Educational Studies in Mathematics

Korean Society for Industrial and Applied Mathematics

Korean Woman in Mathematical Sciences

Korea Institute of Information Security & Cryptology

Korean Association for Mathematical Logic

Korean Society for Mathematical Biology

Korea Society for History of Mathematics

Korean Society of Elementary Mathematics Education

Korean Society of Teachers of Mathematics

Korea Ministry of Education, Science and Technology

Korea Foundation for advancement of Science and Creativity

International Commission on Mathematical Instruction(ICMI)

Korea Sub-commission of ICMI(KSICMI)

National Institute of Mathematical Science(NIMS)

Korea Institute of Advanced Studies(KIAS)

Woman Into Science, Engineering and Technology(WISET)

International Mathematical Union(IMU)

Korea Institute of Curriculum and Evaluation(KICE)

Application Form of Grants of ICME-12

Name*	First Name		Last Name	
Gender*				
Institution*				
Department				
E-mail Address*				
Mailing Address	Street*			
	City*			
	Province		Zip Code*	
	Country/Region*		Phone	
	Fax		Cell Phone	
Description of the applicant's intended contribution to ICME-12	Maximum 400 words			
Possible Dissemination of the Congress outcomes in his/her country/region	Maximum 100 words			
Financial Assistance anticipated from other Sources	Maximum 50 words			

Hotel Reservation Form of ICME-12

Please submit this form via e-mail (icme12@icme12.org) or fax (+82-2-579-2662).

Name*	First Name		Last Name	
E-mail Address*				
Personal Information	Nationality/region*		Gender*	
	Passport No.*			
	Telephone No.		Cell-phone No.	
Room Deposit	Credit Card No.*			
	Exp. Date*		Card Holder*	
Hotel	Hotel Name*			
	Check-in*		Check-out*	
	Type of Bed	Double Twin		
	Option			
Message				

(*) required information

* Hotel List of ICME-12

	Hotel	Rate (KRW)	Note
<input type="checkbox"/>	Grand Intercontinental	230,000	Super Deluxe
<input type="checkbox"/>	Imperial Palace	160,000	Super Deluxe
<input type="checkbox"/>	Renaissance Seoul	180,000	Super Deluxe
<input type="checkbox"/>	Ellui Hotel	110,000	Deluxe
<input type="checkbox"/>	Ramada Hotel	150,000	Deluxe
<input type="checkbox"/>	Riviera Hotel	150,000	Deluxe
<input type="checkbox"/>	Ibis	150,000	Tourist
<input type="checkbox"/>	Artnouveau City	150,000	Residence
<input type="checkbox"/>	Casaville Samseong	150,000	Residence
<input type="checkbox"/>	Seoul Residence	150,000	Residence
<input type="checkbox"/>	Seoul National University	17,000	Dormitory
<input type="checkbox"/>	Kun-kuk University	66,000	Dormitory

- Please check the hotel of your choice.
- Every room is first come, first serve.
- Rates are for single occupancy (Double bed) in Korean won.
- 10% Service Charge and 10% VAT will be added to all Hotels' price. Exchange rate is subjected to daily fluctuation, but currently 1 EURO 1,600 KRW, 1 US\$ 1,200 KRW
- The rates are subjected to change.
- If you have any question, please contact the ICME-12 Secretariat via email(icme12@icme12.org).

We Create Tomorrows

Our IT initiatives, sustainable management, and global partnerships focus on the business of tomorrow. Meet the future when you bring your event or trade to Coex in Seoul, the blooming metropolitan heart of Korea.

Come create tomorrows with us!



36,007 m² Prime Exhibition Space • 92 Meeting Rooms
5-Star Hotels, Transport Hub, & Shopping Mall On-Site
180 Exhibitions & 2,000 Conferences Hosted Annually



:: Convention Enquiries

Tel. 82-2-6000-1123
Fax. 82-2-6000-1303
E-mail. marketing@coex.co.kr

:: Exhibition Enquiries

Tel. 82-2-6000-1128
Fax. 82-2-6000-1311
E-mail. mktg.exhibition@coex.co.kr



we bring people together