

## Study Programme

Sunday Dec 3	Monday Dec 4	Tuesday Dec 5	Wednesday Dec 6	Thursday Dec 7	Friday Dec 8
Arrival and registration	9.00-10.00 Opening ceremony	8.45-10.45 5 parallel sponsored Software workshops	9.00-10.45 Plenary Panel Mathematical practices	9.00-10.45 Plenary Panel Regional	9- 10.00 2 Plenary reports Presentations from WG
	10.00-11.15 Keynote Papert				
	11.15- 11.30 Coffee break	10.45.-11.15 Coffee break	10.45-11.15 Coffee break	10.45-11.15 Coffee break	10- 10.30 Coffee break
	11.30-12.30 Working Groups Study Session 1	11.15- 12.30 Paper presentations 4 parallel sessions x 3 papers	11.15- 12.30 Working Groups Study Session 4	11.15- 12.30 Working Groups Study Session 5	10.30 – 11.45 Keynote Artigue ICMI & Closing Ceremony (to 12.15)
	Lunch	Lunch	Lunch	Lunch	Lunch
	14:00- 15:45 WG Study Session 2	14:00- 15:45 WG Study Session 3	Excursion	14:00- 16.00 WG Study Session 6	School visit
	15:45- 16:15 Tea break	15:45- 16:15 Tea break		16.0- 16.30 Tea break	
	16:15-18.00 Paper presentations 4 parallel sessions x 4 papers	16:15-18:15 Plenary Panel Connectivity Chair Hoyles		16.30- 18.00 3 Plenary reports Presentations from WG	
	18.00 Welcome reception	18.15-19.45 Poster presentations	18.15-19.45 Project presentations	20.00 Dinner	18.00-19.30 Project presentations
		20.00 Dinner	20.00 Dinner		20.00 Banquet Cultural evening

# Abstracts of plenaries and panels

*Monday 10.00-11.15*

## **Keynote: From the Math Wars to the New New Math**

by Seymour Papert, Massachusetts Institute of Technology (USA)

The “Math Wars” (Google this!) pit Reformers against an Unholy Alliance of Mathematicians and Back-to-Basics fundamentalists. The principled conflict is between rigor and engagement: the Reformers use slogans like engaged, child-centered and authentic; the Mathematicians accuse them of producing a “fuzzy math” stripped of the essence of mathematical thinking. Both sides are right in the values they assert. Both are wrong in posing the problem as traditional mathematics VS a stripped version thereof. Adopting principles of computation (including but not confined to programming) as the new Basics opens the possibility of creating a new math that is more engaging than what the Reformers propose and more rigorous than what the Alliance defends. My proposed design principles include: (1) Learn from the Old new Math: it went in such a wrong direction that it almost defines what needs to be done as “do the opposite” and (2) Assume full time access to computers, which opens the interesting possibility that developing countries adopting the “100 dollar laptop” will lead the way in the development of a new approach to mathematics education.

*Tuesday 16.15-18.15*

## **Plenary Panel: connectivity**

Participants:

Celia Hoyles, Institute of Education, University of London, UK (chair), Ivan Kalas, University of Bratislava, Slovakia, Richard Noss, London Knowledge Lab, Institute of Education, University of London, UK, Luc Trouche, INRP, France, Uri Wilensky, North Western University, Chicago, USA

Participants in the panel will present their specific vision and experience of exploiting connectivity to promote mathematics learning. Panelists will each summarize the aims of their work, demonstrate their approach in ways that will draw in the audience, and end by giving some results and implications for learning mathematics and the practice of mathematics. In the final discussion, panelists will discuss and seek to draw out some common threads concerning the implications of connectivity for theory and practice, its potential and constraints, with special consideration of issues of access and diversity. At this point there will also be opportunity for interaction between panellists and conference delegates. Celia Hoyles will chair the panel and introduce issues derived from her own experience and research, where appropriate.

*Wednesday 9.00-10.45*

### **Plenary Panel: Design for transformative practices**

Participants:

Douglas Butler, ICT Training Centre UK; Nicholas Jackiw, KCP Technologies, Inc., USA; Jean-Marie Laborde, Cabrilog, France; Jean Baptiste Lagrange, IUFM Reims, France (chair); Michal Yerushalmy, Technion Israel.

Contributions to the panel will demonstrate the potential and specific affordances of digital technologies for learning mathematics, discuss the constraints and challenges involved in designing tools that can enhance and transform student mathematical activity as well as support curricular evolutions. The panellists will each present their specific vision and experience before responding to interactions from conference delegates.

*Thursday 9.00-10.45*

### **Plenary Panel: Regional presentations from selected continents: celebrating diversity**

*Participants:* Alexei Semenov, Russia; Cyril Julie, South Africa (chair); Allen Leung, China; Ana Isabel Sacristan, Mexico.

This plenary panel will present short reflections on the use of digital technologies in mathematics from a regional perspective. It is especially relevant to the meeting given its emphasis on learning from cultural diversity. Contributors will very briefly summarise some of the major uses of digital technologies in mathematics in their country while if possible referring to other countries in the region for comparison or contrast. We hope that the panel will demonstrate the diversity of use but also raise challenges, that specifically address issues of mathematics teaching and learning.

*Friday 10.30 – 11.45*

### **Keynote: The future of teaching and learning mathematics with digital technologies**

by Michèle Artigue, Université Paris 7, France

About twenty years separate the first Study ICMI devoted to technology from this one. Within these two decades, the technological landscape has seriously evolved. The technological tools on which the first study focused represent only a reduced part of the digital technologies that are or can be used for mathematics teaching and learning today, and the creativity in terms of technology seems endless. The way digital technologies affect the functioning of our societies has also dramatically changed with evident consequences on education at large. Technology has no longer only a positive image and equity issues hardly evoked twenty years ago are now on the front of the scene, as reflected by the discussion document.

In these two decades too, research has developed all around the world; theoretical constructs have emerged in order to help us address technological issues in mathematics education; experiments have been carried out and substantial results obtained. Where are we now? And up to what point is the knowledge we have gained useful for thinking the future of teaching and learning mathematics with digital technologies? What educational needs do we face today and what could be a reasonable agenda for research and development work in this area?

In this lecture, building on my personal knowledge of the field and on the contributions to the Conference, I will globally address these questions, structuring the lecture around three perspectives that, in my opinion, are especially insightful in order to reflect on the potential and limitation of what has been achieved so far for thinking about the future: the theoretical perspective, the teacher perspective, the institutional and curricular perspective.

## Parallel paper presentations

### *Monday Session I, room*

Name		Number	title	Time
Ana	Sacristan	c64	On the Role and Aim of Digital Technologies for Mathematical Learning: Experiences and Reflections Derived from the Implementation of Computational Technologies in Mexican Mathematics Classrooms	16.15
Colleen	Vale	c30	Gender and Socio-Economic Issues in the Use of Digital Technologies in Mathematics	16.40
Jim	Ridgway	c40	Mathematics Revisited and Reinvigorated.	17.05
John	Olive	c8	Distance Learning: Mathematical Learning Opportunities for Rural Schools in the United States	17.30

### *Monday Session II, room*

Name		Number	title	Time
Chow Ming Kong		c37	Integrating Graphic Calculator into the Singapore Junior College Mathematics Curriculum: Teacher Change	16.15
Chronis	Kynigos	c67	Half-baked Microworlds in Constructionist Tasks Challenging Teacher Educators' Knowledge	16.40
Colette	Laborde	c9	Study of a Teacher Professional Problem: How to Take into Account the Instrumental Dimension when using Cabri-Geometry ?	17.05
Jaap	Den Hertog	c55	Towards Guided Reinvention in a Multimedia Learning Environment for Prospective Teachers	17.30

### *Monday Session III, room*

Name		Number	title	Time
Allen	Leung	c65	Instrumental Genesis in Dynamic Geometry Environments	16.15
Arthur	Lee	c35	Developing Learning and Assessment Tasks in a Dynamic Geometry Environment	16.40
Hee-Chan Lew		c4	Pappus in a Modern Dynamic Geometry: An Honest Way for Deductive Proof	17.05

**Monday Session IV, room**

Name		Number	title	Time
Alan	Maloney	c13	Graphs 'N Glyphs as a Means to Teach Animation and Graphics to Motivate Proficiency in Mathematics by Middle Grades Urban Students	16.15
Ferdinando	Arzarello	c66	Curricular Innovation: An Example of a Learning Environment Integrated with Technology	16.40
Maria Fabrice	Mariotti Vandebrouk	c54	Developing a Joint Methodology for Comparing the Influence of Different Theoretical Frameworks in Technology Enhanced Learning in Mathematics: The TELMA Approach	17.05
Keith	Jones	c41	Theoretical Perspectives on the Design of Dynamic Visualisation Software	17.30

**Tuesday Session V, room**

Name		Number	title	Time
John	Monaghan	c43	Teachers, Technology and Cultural Diversity	11.15
Lulu	Healy	c44	A Developing Agenda for Research into Digital Technologies and Mathematics Education: A View from Brazil	11.40
Merrilyn	Goos	c72	Understanding Technology Integration in Secondary Mathematics: Theorising the Role of the Teacher	12.05

**Tuesday Session VI, room**

Name		Number	title	Time
Carolyn	Kieran	c58	Learning about Equivalence, Equality, and Equation in a CAS Environment	11.15
Chris	Sangwin	c79	Assessment within Computer Algebra Rich Learning Environments	11.40
Maria	Mariotti	c32	New Artefacts and the Mediation of Mathematical Meanings	12.05

***Tuesday Session VII, room***

Name		Number	title	Time
Rudolf	Straesser	c38	Dynamical Geometry Environments: Instruments for Teaching and Learning Mathematics	11.15
Vincent	Geiger	c60	More than Tools: Mathematically Enabled Technologies as Partner and Collaborator	11.40
Nicholas Nathalie	Jackiw Sinclair	c81	Dynamic Geometry Activity Design for the Elementary School Classroom	12.05

***Tuesday Session VIII, room***

Name		Number	title	Time
MariaDolores	Lozano	c19	Developing Resources for Teaching and Learning Mathematics with Digital Technologies in Enciclopedia, a National Project	11.15
Richard	Noss	c6	Designing for Diversity through Web-based Layered Learning: a Prototype Space Travel Games Construction Kit	11.40
Peter	Boon	c85	Designing didactical tools and microworlds for mathematics Educations	12.05

# Parallel sponsored workshops

*Tuesday 8.45-10.45*

## **Autograph 3**

Delegates will be able to try out the successful dynamic software Autograph. Autograph has evolved from the classrooms of Oundle School in England, and gives teachers and pupils new opportunities to visualise coordinate geometry (in 2D and 3D) and probability/statistics. Autograph operates at two levels: 'Standard' (no radians, no calculus and a simplified interface) and 'Advanced'.

Autograph uses dependent, selectable objects to give a fresh view of both elementary and advanced topics, including Calculus, Trigonometry, Transformations and Vectors (in 2D and 3D), and has special tools to facilitate its use on Interactive Whiteboards. The latest version of Autograph is fully Unicode compliant for running on all languages versions of Windows. The presenter is Douglas Butler, a secondary school teacher of many years, but who now runs training workshops for mathematics teachers in England and in many other countries. Douglas is a frequent speaker at international conferences, and is manager of the Autograph development team in England.

## **Cabri**

During the last 20 years, counting to date more than 100 million users, Cabri software has become a worldwide reference to help students learn 2D and/or 3D mathematics on computers, TI graphing calculators and interactive whiteboards. Recently a wide research, led at the university of Madrid (Spain) made over 6 years on 15 000 students from secondary schools in Europe has demonstrated a 30% improvement on math learning efficiency thanks to Cabri software.

Cabri philosophy is based on direct engagement of students, giving them the simple, tailorable and intuitive tools to discover the mathematical properties, not only in the plane but also in the space. The latest "Cabri plug-in" technology now allows teachers to insert interactive figures in Word and Powerpoint documents, as well as in web pages. This way, students who do not have a Cabri license can still visualize and manipulate the activities on those documents. Cabri II Plus and Cabri 3D are available in more than 20 languages, including Vietnamese, Thai, Korean, and Japanese.

Participants to the workshop will learn how to take advantage of the latest Cabri products especially Cabri 3D. Connections between various math domains, especially from a geometric perspective, will be presented throughout the workshop showing the benefit of the technology from elementary school to university. It will combine visualisation, computation and geometric construction. Presenter: Jean-Marie Laborde formerly Research Director (CNRS) at the university of Grenoble and now leading the Research and Development at Cabrilog.

## **Iteration with Sketchpad**

This hands-on workshop will introduce The Geometer's Sketchpad software, and then focus on its iterative capabilities to explore iterative mathematical concepts that occur across the school mathematics curriculum. Numeric iteration topics will range from simple number patterns (middle school mathematics) through sequences and series and integration (calculus); geometric iteration topics will range from repetitive constructions (tessellations, wallpaper groups) to recursively defined geometric structures (fractals and dynamical systems).

Presenters: Steven Rasmussen, President, Key Curriculum Press, Inc. ; Nicholas Jackiw, CTO, KCP Technologies, Inc.

## **Aplusix**

Aplusix is a piece of software for arithmetic and algebra which lets students solve exercises and provides feedback: it verifies the correctness of the calculations and of the end of the exercises. Experiments in several countries and in several situations, from 2002, have had very positive results, measured with pre-test and post-test.

Aplusix has 4 types of activities: (1) Training where students benefit of feedbacks at any moment; (2) Test where students have no feedback and limited time; (3) Self-correction where students see a test they passed with feedbacks and correct their errors; (4) Observation where students or teachers see a previous work, action by action.

Aplusix has: (1) 400 patterns of exercises, organized by type and level; (2) Parameters for customization by the teacher; (3) Statistics on attempted/well-solved exercises and calculation errors; (4) An application for building exercises and problems; (5) An administration application.

The workshop will present the main functionalities of Aplusix. The participant will use software, playing the role of a student, then the role of a teacher. The presenter will be Hamid Chaachoua (IMAG, Grenoble, France).

## **Texas Instruments (P. Daly)**

## **Information about UNESCO**

Through international cooperation and partnerships, UNESCO organizes activities, especially in developing countries, to promote capacity-building for research and advanced training in mathematics and mathematics education, and in general, to enhance public understanding and appreciation of the importance of mathematics in society and daily life.

UNESCO encourages the participation of mathematicians and mathematics teachers from developing countries by supporting ICMI Study 17 in Hanoi on 3-8 December 2006.

Within the Asia-Pacific region, UNESCO, through its Regional Bureau for Science based in Jakarta, Indonesia, supports the South East Asian Mathematical Society (SEAMS) in organizing conferences, seminars and workshops to provide a platform for promoting partnerships and collaboration among mathematicians and mathematics teachers in the region.

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## Project presentations

Beside the activities of the conference, special time slots offer participants the possibility of presenting personal projects. Information will be given by the presenters.

### **Tuesday 18.15-19.45 (parallel)**

#### ***Representing Mathematics with Digital Media***

Chronis Kynigos, CTRI, Athen, GREECE.

#### ***Examples of Undergraduate Student Achievement in a Technological Learning Environment***

Chantal Buteau, Brock University, CANADA.

#### ***An example of technological integrated curriculum: the UMI proposal and the Mathematics Laboratory***

Ferdinando Arzarello, Università di Torino, ITALIA.

### **Thursday 18.00-19.30 (parallel)**

#### ***Technology in Mathematics Education: Victoria, Australia***

Helen Forgasz, Monash University, Australia

#### ***Designing and deploying games for learning mathematics***

Dave Pratt, University of Warwick, UK.

Niall Winters, University of London, UK.