
CONFERENCES

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Contemporary Mathematics Education – CME’18

The international biennial conference ‘**Contemporary Mathematics Education**’ (formerly known as Children’s Mathematical Education) was held at the Faculty of Mathematics, Informatics and Mechanics of University of Warsaw, from 11th to 14th July, 2018 in Warsaw, Poland. The theme of the CME’18 conference was *Mathematics in the Real World*. This event has already been the sixth in the series, marking the 10th anniversary from the first conference back in 2008.

The conference, planned as a working meeting for all those who are interested in teaching mathematics to children between 3 and 18 years old congregated nearly 80 participants from several countries, including Hungary, Israel, the Czech Republic, the Netherlands, Germany, Portugal, Denmark, USA, Italy, Greece, Slovakia, Latvia, Kazakhstan, and Poland.

Among the participants there were:

- researchers interested in all aspects of teaching and learning mathematics;
- teacher trainers involved in in-service and pre-service teacher training;
- mathematicians, who want to support teaching mathematics at school level;
- reflective practitioners (teachers);
- students – future teachers.

The CME’18 conference was supported by two committees:

The *International Programme Committee*, which consisted of: Peter Appelbaum (USA), Eszter Kónya (Hungary), Jenni Back (UK), Ján Gunčaga (Slovakia), Paola Vighi (Italy), João Pedro Da Ponte (Portugal), Jana Slezáková

(Czech Republic), Lambrecht Spijkerboer (The Netherlands), Ewa Swoboda (Poland, Chair), Michal Tabach (Israel), and Konstantinos Tatsis (Greece).

The *Local Organising Committee*, which consisted of: Zbigniew Marciniak – University of Warsaw, Małgorzata Zambrowska – The Maria Grzegorzewska University in Warsaw, Zuzanna Zambrowska – Association “Develop yourself”. Education, Culture, Sports, Ewa Swoboda – University of Rzeszow, Bożena Maj-Tatsis – University of Rzeszow, Marta Pytlak – University of Rzeszow.

The programme of the CME’18 conference included Plenary Lectures, Working Seminars, Research Reports, Workshops and Poster presentations. In this report we will mainly refer to the plenary lectures and the working seminars. The descriptions that follow are taken by the abstracts provided by the plenary lecturers and the working seminar leaders.

Plenary Lectures

During this meeting four plenary lectures were presented. The first one was conducted by **Mogens Niss**, Emeritus Professor from IMFUFA/INM Roskilde University, Roskilde, Denmark. The second one was presented by **Zbigniew Marciniak** from Warsaw University, Poland. The third plenary speaker was **Fragkiskos Kalavasis** from the University of the Aegean, Greece. The fourth plenary speaker was **Christine Knipping** from the University of Bremen, Germany.

Mogens Niss (Denmark) presented a talk entitled: *How can we use mathematics education research to uncover, understand and counteract mathematics specific learning difficulties?* In this talk he referred to mathematics education research from the last four decades and how it has helped us to understand more about the nature and processes of mathematical learning. This has further helped us to uncover and understand characteristic obstacles that most learners of mathematics – and not only those with general learning difficulties – encounter during their attempts to learn mathematics, some even to a detrimental degree. Mathematics specific learning difficulties seem to be of a rather universal nature across cultures, countries and students. In this talk he presented a research based in-service education programme for upper secondary school teachers enabling them to detect and diagnose upper secondary students with mathematics specific learning difficulties and eventually to remedy or reduce these difficulties.

Zbigniew Marciniak (Poland) presented a talk entitled *Winds of change in math education*. The talk reported on the current discussions concerning the changing expectations with respect to mathematics education in XXI century, in the context of the development of the new mathematics framework for the 2021 OECD PISA test.

Fragkiskos Kalavasis (Greece) presented a talk entitled *Mathematics and the real world in a systemic perspective of the school*. In this talk he approached the variety of the debates about mathematics and/or reality in the framework of the interdisciplinary and institutional environments of teaching and learning mathematics. These environments form a complexity that includes and is at the same time included in the didactic of mathematics situations. Therefore, a new variety of approaches of the relation between mathematics and reality emerges, in which the cognitive, the psychological, the social and the digital are interconnected. It is hard to model the interactions of this variety with the underlying epistemological or philosophical one, because of the complexity of roles and intentionalities in school. Additionally, the role of representations and symbolic languages, so much crucial into mathematics, becomes a kind of obstacle in the interdisciplinary learning path of the students in the everyday school timetable across the different disciplines. The well-studied didactical transposition is enriched with the praxeological transposition. In his talk he presented concrete examples of the history and epistemology of mathematics as well of the reforms in mathematical education and more particular the influence of Jean Piaget works, to animate the discussion between mathematics and real world in this and of the systemic approach of the school.

Christine Knipping (Germany) presented a talk entitled *Understanding optimisation as a principle*. Optimisation problems are classic problems in mathematics and the real world. Since the 1980s the landscape of solving optimisation problems has fundamentally changed in the era of high dimensional computing capacities as can be used today. Numerical approaches cap analytical ones since then. This shift recasts currently processes in industry as well as modelling of nature, climate change and so forth. In order to allow students to understand how mathematics and specifically optimisation is used and needed today to solve complex application problems, such as landing a spaceship on the moon, controlling robots to place objects precisely or to run a smart farm, mathematicians and mathematics educators need to work together. Inviting mathematics classes from schools to the university to learn about this, is one way of making this knowledge and these new approaches accessible to students and teachers. Principles of this approach and how these can be made accessible to students were presented in this talk.

Working Seminars

The Working Seminars have been the most important part of the conference. They consisted of four 90-minutes meetings and participants worked with one

leader. The work was focused on five educational levels: 3–6 years old (kindergarten); 7–9 years old (primary school); 10–12 years old (primary school); 13–15 years old (secondary school), 16–18 years old (upper secondary school). Each participant was invited to be a member of one of the working groups. Discussions and exchange of experiences and ideas were the essential aspects of this activity. Each group was coordinated by the following leaders.

- level 3–6: **Chrysanthi Skoumpourdi (Greece)** – *Kindergarten mathematics in the real world*
- level 7–9: **Jan de Lange (The Netherlands)** – *The secrets of challenging activities for younger children*
- level 10–12: **Ineta Helmane (Latvia)** – *How to create tasks in Mathematics based on the thematic approach?*
- level 13–15: **Zoltán Kovács (Hungary)** – *Problem posing – tasks and challenges.*
- level 16–18: **Lambrecht Spijkerboer (The Netherlands)** – *Surface and deep approach in the mathematics classroom.*

Chrysanthi Skoumpourdi conducted a seminar entitled *Kindergarten mathematics in the real world*. It was addressed for the youngest educational level and focused on the correlations between kindergarten mathematics and real world situations and on the importance of this dynamic connection. During this seminar the following issues were discussed:

- What do we mean by ‘mathematics in the real world’?
- Is a real situation for us, always real for kindergarten children?
- Which concepts, of the core mathematical units that are taught in kindergarten, can be related with real-world situations?
- Which real-world situations could be used as a context for designing mathematical activities for kindergartners?
- Under what circumstances are real-world mathematics activities motivate children’s mathematical learning?
- What triggers children’s interest to participate to these activities?
- Does educational material play a role to this dynamic connection between kindergarten mathematics and real world situations?
- Could we distinguish the factors that are necessary both for designing activities and for creating educational material appropriate for kindergarten mathematics in the real world?

Participants worked together. They discussed and exchanged experiences and ideas in order to design real-world mathematical activities, as well as educational material for the teaching practice.

Jan de Lange during his working seminar for the second educational level tried to find the answer for the following issue: *The secrets of challenging activities for younger children.*

During the sessions the following four topics were discussed:

- The validity of the hypothesis based on the opinions, experiences and knowledge of the participants.
- The desirability of math education in this age range of the integration of arithmetic, mathematics and geometry.
- The role of STE of STEM in M(athematics).
- Design and Examples of materials fitting the hypothesis “The learning the mathematics should take place in the real world context of challenging activities, facilitating ample exploration, and used in applications. In this way executive functions will be developed.”

The Working Seminar for the third educational level was conducted by Ineta Helmane. The main theme of this seminar was *How to Create Tasks in Mathematics Based on the Thematic Approach?* Participants of the workshop got acquainted with and analysed materials about the nature of the thematic approach as well as aspects of the thematic choice in the acquisition of mathematics content using the thematic approach in primary school. In the leader's words: “Teaching mathematics thematically emphasises the application of mathematics around a central theme whereas teaching in topics predominantly focuses on the mathematical content. Mathematics content in the framework of the thematic approach is associated with the development of skills in practical activities, the so called ‘hands on’, the correlation of the acquired knowledge based on the theme or a concept; also, skills that can be applied in lifetime actions as well as the development of a sound personal attitude, values and goals. The topicality should be linked with happenings in one's personal life as well as the latest developments in the community life, socio-economic processes or a scientific context. Applying the thematic approach in mathematics content, we must use such thematic aspects which pupils could encounter in real life associating them with happenings in the private or community life, socio-economic processes or with a scientific context, for example: pupils' personal experience and situations, socio-economic processes, calendar time, scientific and technological processes, topics related to the content of other school subjects.” During this working seminar participants

had the opportunity to create tasks and activities for acquiring mathematics applying the thematic approach.

Zoltán Kovács conducted a working seminar focused on *Problem posing – tasks and challenges*. The topic was addressed to 13–15 year-old children. The seminar’s motto was the following Polya’s words: “The mathematical experience of the student is incomplete if he never had an opportunity to solve a problem invented by himself. The teacher may show the derivation of new problems from one just solved, and doing so, provoke the curiosity of the students”. Each day the participants of the seminar worked with a problem variation chain deriving from an initial problem. The first part of the seminar modeled a classroom situation, while in the second part participants discussed the methods applied. They also discussed how the group leader has coped with the open nature of problem posing episodes. After that they were summarising the challenges the teacher may face during problem posing activities.

Lambrecht Spijkerboer, the leader of the fifth working seminar which focused on older students (age 16–19), entitled his seminar *Surface and deep approach in the mathematics classroom*. The work was related to the following topics:

- Surface and deep approach in learning mathematics.
- Different approaches in building the concept of relations.
- Ways of working to deal with differences.

During the sessions the participants tried to find opportunities for making motivational lessons for gifted and non-gifted students in different classes.

During the CME’18 conference nineteen research reports were presented, in which the researchers presented and discussed with the audience the results of their own work. Additionally, six workshops took place in the conference.

The full texts of the plenary lectures, as well as the research reports are published in a monograph entitled “Mathematics in the Real World”, edited by Bożena Maj-Tatsis, Konstantinos Tatsis and Ewa Swoboda.

We invite you to visit our website: <http://www.cme.rzeszow.pl/> for more information on CME’18, as well as all the previous CME Conferences.

The next CME conference will be held in July 2020 in a location yet to be announced.

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