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Remarks on the Fifteenth Slovak-Polish-Czech Mathematical School and the Sixth Nitrianska Mathematical Conference

The article summarises *the Fifteenth Polish-Czech-Slovak Mathematical School* and the *Sixth Nitrianska Mathematical Conference (Nitrianska matematická konferencja)* - the meetings of Polish, Czech and Slovak mathematicians and mathematics teachers that took place this year.

The Fifteenth Polish-Czech-Slovak Mathematical School was organised by the Slovak Faculty of Pedagogy at the University of Ružomberk (Pedagogická Fakulta Katolíckej Univerzity) and was held from 4th till 8th June in Spišská Kapitula in Slovakia. The *Sixth Nitrianska Mathematical Conference* was organised by the Department of Mathematics at the Constantine the Philosopher University in Nitra (Univerzita Konštantína Filozofa v Nitre) and took place on 18th September 2008. The organisers publish complete texts of conference presentations, therefore this paper focuses only several points chosen.

Both conferences were divided into two sections:

- Theory of Mathematics Teachers Training – devoted to the presentation of research results on the teaching of mathematics on different levels of education
- Mathematics and its Applications – devoted to the presentation of the results of works from various fields of mathematics.

Apart from the seminars in the two sections mentioned above, the conference participants could attend six lectures given in Spiška Kapitula:

1. Graph as a carrier of schema – by M. Hejný;
2. Probability around us (book presentation) – by A. Płocki;

3. Modernisation and innovation of calculus teaching. – by J. Gunčaga;
4. Problem solving with the help of invariants of transformations – by J. Kopka;
5. Topology: why open sets? – by R. Frič;
6. Magic topics – by M. Trenkler.

Hejný talked about reading of the structure of a data set represented on a graph from the graph in question. He also discussed application of the method presented to the theory of training.

Płocki described basic points of his book (Płocki, 2004), which was published in Slovak this year.

Gunčaga presented a new approach to calculus teaching and understanding the concepts of limit, derivative and integral in particular. Application of information technology proves useful in this process (Eisenman P., Fulier J., Gunčaga J., 2008).

Frič presented historical and methodological aspects that lead to better understanding of topological structures.

Trenkler discussed the connection between magic graphs, magic squares and cubes. The second part of his lecture concerned new constructions of magic rectangles and their generalizations into three-dimensional space.

The lectures in the first section of the conference presented the following problems:

1. Forming the mathematical activity aspects on different levels of education
2. Supporting the teaching of information technology on different levels of education (graphing calculators, computers, e-learning)
3. Teaching at the tertiary level and the education of teachers

As regards the presentations on the results of research on teaching conducted in Poland and the Czech Republic, it is essential to mention Ewa Swoboda's work "Patterns and Language." In her book, she presented the results of an experiment with kindergarten children, aged 4-6. The question that Swoboda addressed in her research was – how to inspire children to use verbal language in their solving of geometrical tasks.

Perceiving, discovering and also being able to use regularity is an essential, yet not always appropriately valued, element in the mathematical upbringing on every stage of one's education. B. Nawolska presented her results of investigating these problems.

In her paper J. Hodaňová presented mathematical competitions carried out in primary schools in the Czech Republic. The "Mathematical Olympic Games" and "Pythagoras Games" are competitions for pupils talented in mathematics and the tasks appearing in these competitions are amusing, smart and pleasant. The pupils succeed if they have deep theoretical knowledge of mathematics, logical thinking skills and combinatory abilities. The aim of these competitions is to develop pupils' creativity.

Regularity is one of the basic ideas in mathematics. Rhythms and regularities can be found in almost every field of mathematics: analysis, arithmetic, algebra, geometry and statistics. Solving the tasks connected with discovering and generalising regularity is one of the ways to develop students' algebraical thinking. M. Pytlak carried out research on discovering the regularity by 9-year olds.

P. Molnár conducted his research in 2007 among students of 4 second high-school classes. The aim was to find out how students can use a variable in the solution of a word problem. More precisely, he tried to find out whether the students can establish a variable and subsequently form one linear equation with one variable, eventually a system of two linear equations with two variables.

G. Rygał discussed development of pupils' logical thinking through the teaching of mathematics.

Teachers from the countries participating in the conference talked about efforts of using information technology in the teaching of mathematics. These issues were discussed by A. Dąbrowicz-Tlałka (University of Technology in Gdańsk), J. Stańdo (Technical University in Łódź), B. Wikel (University of Technology in Gdańsk).

The problem discussed in the presentations of R. Engel and S. Lukáz was the technological support for the realisation of the interactive mathematical educational activities. Nowadays, new media are entering school. One of them is the platform for distance teaching. Some pupils have big troubles with solving mathematical problems at school. In his presentation T. Ratusiński tried to answer the question whether an e-platform can help with problems of teaching mathematics.

A few presentations concerned problems with studying mathematics, in particular:

- Strategies of solving tasks with percentages – B. Bugajska-Jaszczołt, M. Czajkowska, D. Drygała.
- Remarks on definitions and the process of defining mathematical notions – J. Major, M. Major.

- From investigations on forming notions of various types of integrals in the students of pedagogical studies – Z. Powązka.

During the conference the problem of education of teachers was also discussed. In his paper B. Maj presented a research project carried out among mathematics teachers. The aim of the project was to improve teachers' ability to develop creative mathematical activities. For that purpose, diagnostic activities, workshops and lesson observations were organized. The results show considerable improvement in the teachers' ability and their attitude towards mathematical activities.

The problems in focus during the conference in Nitra were parallel to the issues discussed at the first conference described. The aim of the conference was to exchange information on research in mathematics and mathematics teaching that are being conducted currently.

Describing the presentations delivered during the conference it is worth to mention that by A. Prídavková. She stated that the development of the ability to solve problems is one of the aims of primary education. Mathematics as an educational discipline is a useful tool of competence formation. It is crucial that teachers be able to present different strategies of solving mathematical tasks. The contribution presents one of the possibilities of development of the ability to elaborate solving strategy of mathematical tasks.

I. Scholtzová pointed out that the level of mathematical literacy of the prospective teacher is a result of and formed by mathematical education prior to his or her admission to the tertiary study. Diagnostics of the level of mathematical literacy at the beginning of the university study is thus essential for its further development in the course of training.

A very interesting presentation was given J. Perný. The contribution dealt with the projection of space objects onto a plane by primary school pupils. It explored in detail the mathematical approach and attempted to compare it with the art approach, both with respect to the space imagination development. It experimentally explored the way, in which space is projected by pupils without projection methods knowledge.

The lecture of Tomáš Lengyelfalusy dealt with the teaching of mathematics in the secondary school. In his contribution the author dealt in detail with solving quadratic equations, which are included in the secondary school curriculum. He referred to many connections between the roots and coefficients of quadratic equations. They slightly exceed the secondary school curriculum but they are very important in order to create general view of solving quadratic equations.

Taking part in the two conferences described enabled the participants to

broaden their knowledge and inspired them to further creative work in mathematics and the teaching of this discipline.

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First Announcement

CIEAEM 61

WILL BE HELD JULY 26 to July 31st 2009

At UNIVERSITÉ DE MONTRÉAL,

Montréal, Québec, Canada

MATHEMATICAL ACTIVITY IN CLASSROOM PRACTICE
AND AS RESEARCH OBJECT IN DIDACTICS:
TWO COMPLEMENTARY PERSPECTIVES

We are looking forward to meeting you.

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MATHEMATICAL ACTIVITY IN CLASSROOM PRACTICE AND AS RESEARCH OBJECT IN DIDACTICS: TWO COMPLEMENTARY PERSPECTIVES

Mathematical activity is at the center of any mathematics teaching. It is a means for motivating students and for putting mathematical concepts into context and linking them to other academic subjects and everyday life or with the students' own every day lives (whether they are primary school students, high school, college or university students, workers or in-service teachers). Mathematical activities elaborated by different people (teachers, pedagogical counselors, textbook authors, researchers), for different students can take many forms. Participants of the 61st meeting of the CIEAEM are invited to reflect on and discuss this theme which is divided into 5 sub-themes.

1. Mathematical activity in the 21st century classroom

What are the characteristics of mathematical activity? What are the various types of mathematical activity that one can find in the 21st century classroom? Along with the pedagogical renewal observed in several countries and the competency approach associated with this renewal, project-based pedagogical approaches and the integration of mathematics with other subjects are called upon. What about the mathematics class? It is often stated that projects aiming at integrating several domains, one of which is mathematics, use the mathematical language but fail at helping the students build the meaning of the mathematical concepts involved. What are the characteristics of both pertinent and successful mathematical activities? What about mathematics activities outside the classroom? What activities can we offer outside the classroom? How the new technologies help the design of mathematical activities? What kind of new topics can be discussed because of the existence of these new technologies? How might new and ancient technologies live together and strengthen each other?

2. Problem solving and institutionalization of knowledge

Among the different mathematical activities, those involving problem solving play an important role in the learners' lives. Lakatos, speaking of the nature of mathematics, said that mathematics is a dialogue between individuals who have problems to solve. For the past twenty years, several questions have been explored. Among those that have been studied are the influence of both cognitive and affective factors, and the impact of classroom management (e.g., co-operative settings, the teacher's role, the effects of context). Professors

and researchers in the field of mathematics education have developed theoretical frameworks that were largely promoted and implemented in classrooms (Realistic Mathematics Education, theory of didactical situations). What is the actual situation? What place is given to problem solving in each or your countries? How are the research findings integrated into the curriculum? What are the key questions that are now studied?

3. Creativity in mathematical activities

Mathematical creativity and innovation are often cited as critical to success in work and in life in this twenty-first century world. Teachers, mathematics educators, mathematicians, researchers, parents, and students themselves all have a stake in learning how best to nurture and support this development of mathematical creativity and the realization of mathematical promise. Some of the questions to be investigated in this strand are : What does creativity mean in the process of teaching and learning mathematics? Is this something for all students or only for a few? How might we develop or stimulate creative thinking in the mathematics classroom? How does this balance with skills training? How might mathematical creativity be stimulated outside the classroom? How is this related to mathematical competitions? What is the role of technology in the development of mathematical creativity within and outside the classroom? How might we measure mathematical creativity? How does this fit with high-stakes, standardized or standards-based tests?

4. The promotion of projects and educational design on mathematical activity

The quality of activities used in schools can make a huge difference to the motivation of pupils, students and teachers in the classroom and on the results of their education. There have been informal discussions on the best way forward, and some exploratory work has been done on the design process itself. Over the same period, there has been growing interest in design within the educational research community: there are even some signs of political recognition of its importance. How to further improve the methods of design and development of high quality pertinent activities? How can one take advantage of the findings of other fields of design, pedagogy and cognitive science? What are the criteria for evaluating such activities? How to raise awareness, particularly among decision makers and in the academic community?

5. Research on mathematical activity. Collaboration between teachers and researchers

Research can uncover the basis of mathematical development. It can reveal the sources of obstacles. It can give light to the importance of language, representations, classroom climate, and many other variables of mathematical education. Different types of collaboration between researchers and teachers are taking place. How can a fruitful collaboration between teachers and researchers be put forward? Teachers are also getting more involved in action-research in their own classrooms. What are the characteristics of teacher research? What is the place of theory in the professional development of teachers? In addition to helping the students learn, what other motivations might teachers have to do research?

PROGRAMME OF THE CONFERENCE

The program of the Conference includes several activities: plenaries, working groups, oral presentations and lectures, forum of ideas.

PLENARIES

The program includes plenary sessions where invited speakers will focus on aspects of the conference theme. The plenaries provide a shared input to the conference and form a basis for discussions in the working groups.

Plenary speakers: see the Second Announcement

WORKING GROUPS

Each participant is invited to be a member of one of the working groups that will meet several times.

Working groups will focus on a specific sub-theme or on a number of inter-related themes. This will provide opportunities both for in-depth discussions and for the linking of experiences. These are planned as interactive sessions and are the heart of the conference. Some presentations may be included in these sessions but discussions and exchange of experiences and ideas are the essential aspects of this activity. Each group will be coordinated by two “animators”.

ORAL PRESENTATIONS AND LECTURES

Individuals or small groups of participants are encouraged to contribute to the conference through an oral presentation, thus communicating and sharing

with others their ideas, research work or experiences. Relevant case studies are particularly welcome. Presentations should be related to the theme of the conference in general or to the sub-themes. There will be 20 minutes available for each presentation followed by approximately 10 minutes for discussion. There will be some invited lectures and presentations, as well.

WORKSHOPS

Individuals or small groups of participants are also encouraged to prepare and organise workshops, a more extended type of contribution which should focus on concrete activities and encourage the active involvement of the participants through working on materials, problems or questions relating to the sub-themes. A workshop will last for about 1h 30min.

FORUM OF IDEAS

The Forum of Ideas offers an opportunity to present case studies, learning materials and research projects as well as ideas that are not directly related to the theme. Participants are encouraged to display their work in the exhibition hall. There will be a specific time for contributors to explain and discuss their work with fellow participants.

SPECIAL SESSIONS

There will be some special sessions that will enrich the discussion by presentations of country-specific views on recent developments in mathematics education.

CALL FOR PAPERS

We hope that all participants will contribute “actively” to the conference by sharing with others their experiences and views in the various sessions, particularly in the working groups. Moreover, you are encouraged to send a proposal for an oral presentation or a workshop, or to bring a contribution to the Forum of Ideas.

Proposals for ORAL PRESENTATIONS AND WORKSHOPS can be made by sending a FOUR PAGE text (about 1800 words or 12000 characters with spaces), BEFORE JANUARY 15, 2009, including:

- Title, authors’ names and affiliations
- Aim and main idea of the reported study, methodology and the expected conclusions

– Related essential references

The language of the proposal should be the same as that of the oral presentation (English or French). Once your proposal is accepted you will need to prepare an abstract or summary in the other official language together with overhead projector transparencies or diaporama in both languages. Members of the Commission can assist the participants in translating their transparencies if they ask for help ahead of time.

For a contribution to the FORUM OF IDEAS, you must send us a ONE PAGE presentation (about 450 words or 3000 characters, empty spaces included) with a title, authors' names and affiliations and a short description of the content, including information about the type of material to be presented (poster, models, video).

THE DEADLINE FOR CONTRIBUTIONS TO THE FORUM OF IDEAS IS FEBRUARY 28 2009

HOW TO SEND YOUR PROPOSALS FOR PRESENTATIONS, WORKSHOPS AND CONTRIBUTIONS TO THE FORUM OF IDEAS

Please send us a computer file (if possible, by using Microsoft Word saved as .doc or .rtf) with your proposal to the following E-mail address:

louise.poirier.2@umontreal.ca

chahn@negocia.fr

szenax@t-online.hu

OFFICIAL LANGUAGES OF THE CONFERENCE

The official languages of the conference are French and English. Everyone is asked to speak slowly and clearly so that all participants can understand and contribute to discussions. All speakers must prepare their transparencies in both languages. We rely on and appreciate the help of those who can translate, to assist their colleagues within each working group. Animators – in most cases – are able to help in both languages.