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Teaching
Mathematics and
Computer Science

Report on
“English Language Section of
Varga Tamás Days”
Annual Meeting,
11–12 November, 2005, Budapest, Hungary

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Abstract. The Department of Mathematics Education at Teacher Training Institute of Eötvös University organised the 5th English Language Section as a part of Varga Tamás Methodical Days. We discuss the activities based on the authors’ abstracts.

Key words and phrases: new methods of mathematics education, visual approach, ‘hands-on’ approach, historical thinking, young researchers, international professional relationship.

ZDM Subject Classification: A60.

The Department of Mathematics Education at Teacher Training Institute of Eötvös University organised the 5th English Language Section in the frame of Varga Tamás Methodical Days.

Varga Tamás Days is an annual conference of Hungarian teachers of Mathematics. The official language of the conference is Hungarian. However, one of the sections is held in English. The aim of the English Language Section is to give an opportunity to researchers to present their results in Mathematics and Science Education and in the history of any of these fields in English. Our aim is also to encourage the researchers to build international professional relationship.

The first meeting was organised on the base of the impression of ‘Researches in Progress Day’ of The British Society for the History of Mathematics¹.

The chairmen are from Hungary or from abroad. The chairmen bring the news in their countries about Hungarian researches of mathematics education and related fields.

“I came away from the meeting with many ideas and have reported the student’s work to my colleagues here at Greenwich.”² – Tony Mann³ (University of Greenwich) wrote in 2001.

David Lingard from Sheffield Hallam University led two meetings, in 2003 and in 2005.⁴ He wrote in his personal reflections in 2003:

“Varga Tamas’ influence upon mathematics education in Hungary, and beyond, cannot be over estimated. Those of us working in classrooms in schools and universities in England have much to learn from what is happening in Hungary now.”⁵

The chairmen also help the contributors by advices, by sending them book lists or articles.

Details about the previous occasions can be found in Hungarian at <http://www.iskolakultura.hu> (2003/XII. 45-78). Some articles are published at International Journal for Mathematics Teaching and Learning, Exeter, <http://www.ex.ac.uk/cimt/ijmtl/ijmenu.htm>.

In 2005 they were seven presentations and two posters on the meeting. We discuss the activities based on the authors’ abstracts.

¹The British Society for the History of Mathematics: <http://www.bshm.org>.

²From the e-mail documentation of the meeting, kept in the Department.

³Tony Mann is Hon. Secretary of The British Society for the History of Mathematics.

⁴David Lingard was a member of the ICMI study on the use of history in the teaching and learning of mathematics, under the joint chairs of the late John Fauvel (from UK, at the OU), and Jan van Maanen (from the Netherlands).

⁵From the e-mail documentation of the meeting, kept in the Department.

Concrete and visual approaches in teacher training

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The communication in our society is progressively shifting towards using more and more visual media and visual messages. At the same time there is a transition in how people absorb information from a sequential and linear way to a more associative and visual approach.

Various efforts and events that attempt to bring science into everyday life, like science centres and festivals, or even television series, are leading, or taking up, this change. In contrast, international comparative studies on the quality of scholastic education, like PISA and TIMSS, indicate that general education has not yet sufficiently answered the challenges put forth by such a change.

As first step to close the gap between the realities outside of school and inside, we propose a teacher training program dedicated to visual culture and to link the abstract with the concrete.

In this paper we present some initial results on a series of courses held in Foligno and Perugia. The audience consisted of teachers from all kinds of schools, including tutors for disabled pupils.

The aim of the course was to develop and test a new methodology along these lines for the subject of mathematics, stressing the importance of concrete and visual tools in all levels of education, and in all situations including children both with and without disabilities.

Some aspects of Neumann’ set theory in the computational proofs

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The naive set theory was failed when Russell find some paradoxon. The answer was the axiomatic set theory. Zermelo said, we get some initialy set, and rules, which map one set to other set, and only those things are sets, what we can get from initially sets and rules. Neumann said, the “in” relation is not universal, only well defined things are possibly in the left hand side. Both of them avoid the Russell paradoxes, and has same power.

Neumann in the “Mathematicians” essay, wrote a lot about the truth, the fundamentals of mathematics, and rigor. The opinion of mathematicians and logicians about the mathematical truth are continuously changing from ancient Greeks to our days. I show some historical examples, most of them has a connection with Euclides V. postulates, but there are some examples from other fields of mathematics such as calculus. The possibility of automated checking the proofs is a new, but of course not the final, interpretation of mathematical rigourosity.

Maths in English lite: teaching Mathematics partly in English in an average school

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I teach Mathematics in English in 30% of the lessons in a normal secondary school, as part of the Alternating action of World-Language programme of Tempus Public Foundation (Világ-Nyelv, Váltogató). In the lecture I am going to share my experience: methods I found useful and teaching materials I collected, part of which can be found on-line or in libraries. My aim is to help teachers who wish to introduce English into their lessons to any degree: whether as an occasional diversion, or on a regular basis.

Spherical surfaces

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Direct manipulation on the spherical surface in the first four grades has a number of advantages and consequences. It adds to the playful and amusing atmosphere of the mathematics classroom. As a familiar and friendly shape, it helps creativity and space perception for future natural science and arts subjects. As compared with experiences on a flat sheet of paper, it initiates and fosters development of geometric concepts on plane and sphere. Interesting and important exercises in spherical geometry refer to properties of natural numbers and

fractions. Experiments on the spherical surface might serve as preparation for fundamental concepts in geography.

The Dutch way of teaching Mathematics

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This presentation surveys the profound ongoing changes in secondary school mathematics in the Netherlands, its history, founding principles and reasons why we Hungarians have to know about it. The emerging Dutch model invites reflection on their school system and asks for some demonstrating examples.

The Copernican revolution

Demonstrating the working of science via the history of astronomy

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The theme of the current teaching allegory is the elaboration on several typical and interesting examples taken from the long and often humpy journey which has led to our present understanding of the universe. As part of this elaboration, we mainly concentrate on aspects of astronomy. We recommend that our topic be dealt with in years 8–9 by the use of 6–8 teaching hours. It may also be dealt with in years 6–7 in open-air school where students make observations as well as play out the various recommended activities.

I can offer a wide opportunity for a dramaturgical approach and this then provides a chance to involve teachers from the drama department who can be provided with ideas by the physics teacher, so allowing significant events in the history of science to be approached through drama teaching methods. Links may also be forged with other subjects such as geography, history, art and art history, technology and literature.

Spidrons

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I shall present the complex surface that I have named the spidron on account of its S-shape and spider-web appearance, and which, in its various transformations, deformations and combinations, has yielded extremely interesting spatial forms and tessellations. The so-called spidron nests, composed of 4, 6, 8 (generally an even number) of spidron arms, form reliefs that can be deformed in an accordion-like fashion. Such nests cut several of the regular and semiregular solids into two mirror-symmetrical halves. With the assistance of professor Emil Molnár, I am attempting to determine and classify all the space-filling shapes using the “D-symbol” named after the three mathematicians Dress, Delaney and Delone. The first examples of that endeavour are shown using the cube cut in half by a spidron nest. We have discovered several sub-species of the spidron family, constructed from a sequence of a single type isosceles right triangles or alternating sequences of two different types of isosceles triangles.

Posters

A mathematical show: chasing isometries

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Several examples of ‘scientific’ and ‘mathematical’ performances have been proposed during the last years, in theatres and movies, that offer an interesting example of the so called ‘informal didactics’.

A conference-show of this kind is the subject of this poster. It has been played successfully several times, in front of different kind of audiences (high-school classrooms, university students, general visitors of the Perugia Science Festival). It offers a panorama on isometries from an unusual point of view, that of the everyday life, to puzzles, music, movies, then a quick look on relationships between groups of isometries and mosaics.

The reactions of the public, both surprised and amused, are interesting and encouraging.

Let's make the balls rotate!

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In modern science centres, the ‘hands-on’ approach allows people to interact with exhibits that demonstrate some scientific idea.

In the University of Perugia, several activities of this kind are offered in several ways to classrooms and to the general public, in order to study their usefulness in teaching mathematics.

In this poster, we will show an activity of this kind, focused on the properties of rotations of balls, with a comparison to the balls used in several games.

The material was organized and built for an Erasmus exchange week, using the ideas and the collection of balls of Prof. Dieter Betten.

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