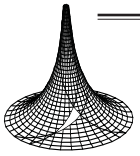

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Teaching
Mathematics and
Computer Science

Report of Meeting
Researches in Didactics of Mathematics and Computer Sciences
January 22 – 24, 2016 Bratislava, Slovakia

The meeting Researches in Didactics of Mathematics and Computer Sciences was held in Bratislava, Slovakia from the 22th to the 24th of January, 2016 at Comenius University in Bratislava. It was organized by the Doctoral School of Mathematical and Computational Sciences of University of Debrecen and the Faculty of Education of Comenius University.

The 60 participants – including 47 lecturers and 15 PhD students – came from 5 countries, 23 cities and represented 32 institutions of higher and secondary education.

After the warm welcome of Róbert Osadan, vice dean of the Faculty of Education, Comenius University in Bratislava and head of Department of Preprimary and Primary Education the conference was opened by professor Gyula Maksa, leader of the Didactic Program of the Doctoral School of Mathematical and Computational Sciences. He welcomed the participants and emphasized the importance of the fact that the conference was held this year at a new location, in Bratislava, in Slovakia.

The subjects presented in the lectures and posters of the conference were of great variety. Beyond the researches on the didactics of mathematics, the use of alternative methods in teaching mathematics, history of mathematics there were several lectures on different subjects in computer sciences.

A very memorable event of the meeting was the sightseeing in the historical centre of Bratislava.

In his closing speech, professor Károly Lajkó, ex-leader of the Didactic Program of the Doctoral School of Mathematics and Computer Sciences appreciated the high quality of the lectures, with special regard to the works of the invited lecturers and PhD students. He also gave his thanks to all the lecturers, the chairs of sessions, and also to the main organizers Eszter Herendiné-Kónya, Edita Partová and Lilla Korenová, whose work essentially contributed to the success of the conference.

Subsequently, we provide the abstracts of the lectures in alphabetical order of the authors' names.

List of abstracts of lectures

András Ambrus: *The worked example effect in mathematics education*

Using worked out examples in mathematics education is traditionally present in the teaching. In our presentation we analyze the possibilities to use worked examples from the cognitive load theory point of view. After a short presentation of human cognitive architecture we give a broad analysis of the cognitive load theory and the possible effects to decreasing cognitive load. Our main aim is to analyze the worked examples in mathematical problem-solving teaching. Beside its theoretical base we give concrete examples taken from our teaching to demonstrate the effect of worked examples on students' learning.

Gabriella Ambrus: *Openness as a problem while solving tasks*

There are already some open tasks to be found in the mathematics textbooks, but their number is quite low. This's probably one of the reasons why solving open tasks is a problem for students. In a survey among elementary school, middle school and first grade university students, we were looking - with the help of a reality based problem - for the answer to the question that in what extent the recognition and the handling of the openness depends on the age of the solver of the problem.

Veronika Árendás: *Talents and competences*

I have been teaching at ELTE TTK since 2012 and in the Jedlik Ányos Secondary Grammar School since 2013. I am also a third year PhD student at the University of Debrecen. My research topic is the criteria and development opportunities of mathematical talent in education. In this presentation, I demonstrate the unique competences and skills needed to solve certain test problems from my

school. The more competences a student has, the more talented he/she is. One of the examined problems will be the Labyrinth (MiMa, Mathematics in the Making, `http://www.mathematicsinthemaking.eu`), which was further developed by one of my students, and also was programmed by another student of mine. Moreover, I analyse a problem from graph theory, and another problem from number theory and combinatorics.

Eszter Árokszállási: *How can we help our average abilities, and maths gifted students at the same time? - Development of the combinatorial thinking in secondary school*

The teaching of combinatorics has a long tradition in Hungary. Despite this, we get such feedback from universities that learners do not know the combinatorics. In my research I am looking for answers to classroom conditions. I use the theoretical background of Bruner's representational levels with medium teacher's guide. Students receive immediate and continuous feedback about their work. I take into account the cognitive load theory and the results of the latest learning theories also. In my presentation I would like to talk about how to develop a maths gifted, and average abilities student, in the last two years.

Tünde Baranyai: *Am I prepared to teach mathematics? - Teaching mathematics at the Institute of Pedagogy and Applied Didactics, Babes-Bolyai University*

The aim of this talk is to study the graduate students' attitude toward the teaching mathematics at the Institute of Pedagogy and applied Didactics, Babes-Bolyai Unisversity. Researching methods used were documents and content analysis and surveying with questionnaires. The results show that most of the students feel prepared to teach mathematics, from theoretical and practical aspects. Based on my research results, I formed recommendations so that mathematics program may become more efficient.

Krisztina Czakóová: *Creation small educational software in the micro-world of small languages* Krisztina Czakóová

Curricular transformation of the national educational programs has increased the criteria of the teaching of informatics and informational upbringing at primary and secondary schools in Slovakia. From teachers are expected to be skilled not only in the use of new technical means and technologies but also in creation of applications for teaching. Teacher training must meet the requirements of the present times with the perspective to the expected changes of the future. Teacher (future teacher) must be prepared to respond properly to changes and adapt to new conditions that development brings to the company. The graduate of teacher

study field should know the latest teaching means and technology, is able work with them use them to enhance effective of the teaching process. A possible solution to integrate new digital technologies into the teaching process of various subjects at primary schools, within strengthen the bonds between subjects of informatics and other subjects, is ability to creation of small educational softwares in micro-world of small languages for special purpose of the educational process.

Petra Csányi - Kata Fábián - Zsanett Szabó: *How to build number theory?*

We investigate the way how Hungarian high school textbooks handle basic notions and terms of number theory. We concentrate on the presentation of the fundamental theorem of arithmetic, the least common multiple and greatest common divisor. Eight families of textbooks are analyzed. We made interviews with the authors of four of them. We conclude that a slightly more precise introduction would not be harmful for pupils and could bring basic number theory closer to them.

Petra Csányi - Kata Fábián - Zsanett Szabó: *What makes the $\sqrt{2}$ irrational?*

This presentation is the continuation of our previous Number Theory projects. This time we are focusing on the proof of the irrationality of $\sqrt{2}$. We analyzed the textbooks of the Hungarian High Schools on how the authors are giving evidence. During our analysis many questions were formulated in us on the proofs regarding the methodology and veracity. In order to gain a response we were carried out several case studies with students and teachers as well. In this presentation we would like to present the results of the surveys and the related algebraic number theory backgrounds.

Edith Debrenti: *The examination of students' geometric shapes identifying ability*

One of the tasks of teaching mathematics is developing students' spatial ability or spatial reasoning. The association of a geometrical content with real situations and objects is recommended for the realization of this task. 'Spatial sense can be described as the ability to understand the outside world'. (Freudenthal, 1972) Thus, competencies related to spatial thinking, the spatial visualization abilities, the ability to recognize geometric shapes met in different environments, and the ability to describe these shapes using geometric terminology should be found among the competencies of the teachers. The aim of this paper was to analyse the responses of 41 students of Primary School and Kindergarten Teacher

Training College students (at Partium Christian University, Oradea)in activity of identifying geometric shapes using 12 photos of real objects.

Éva Dékány: *Engineering and economic mathematics for managers*

In Gödöllő in the Szent István University on the Faculty of Mechanical Engineering there was started a new department of Engineering Manager in 2009 in MA level. Students studying here learn Mathematics too in the first semester. The name of this subject is Engineering and Economic Mathematics. I took this subject over from my colleague this year. During the semester I felt that I would like to do changing in the curriculum mainly in the game theory. I'm going to write two articles on this topic. In the first one I will show the way I checked the knowledge of the students in the first two topics of the semester and the results of them. The second article will discuss why I consider it important and useful to teach the game theory for Engineering Managers and how I am planning the structure of the curriculum. I would like to talk in more detail about these two articles in my presentation.

Barbara Di Blasio : *Classroom research in mathematics teaching*

The aim of the research is to apply informatics in the teaching of mathematics via refining existing methods, and by supporting the establishing of a teaching/learning environment, which is necessary in the 21th century. Secondary grammar schools in Pécs have taken part in the research via starting to apply certain tools of informatics in their daily mathematics teaching. Our classroom research comprised tests, interviews, classroom recordings, and analysis of classroom teaching. As a first result, it can be stated that increased usage of tools of informatics on its own has not resulted in significant improvement in students' results. Our conclusion is that a better infrastructure on its own is not sufficient for obtaining better classroom results. Teachers' digital competencies have to be improved, too. Also helping teachers to easily gain access to well-organized, good quality digital material is required, and supporting teachers in how to integrate digital material in their teaching, eventually in the didactic of mathematics seems to be necessary. Our related didactic findings will be reported on in our talk.

Sándor Dobos: *Management of Internet of Things in the enterprise environment*

The Internet of Things (IoTs) will grow to a 670B USD business by 2017; also each type of device has their own controlling platforms, web or application based. The enterprise size companies are using IoTs in their environment in order to achieve their business goals. However companies, in any environment, need to

meet the applicable security regulations to keep data secure. After smart-phones with BYOD (Bring Your Own Device) risk IoTs are giving similar challenge, to be managed, updated, maintain security. Common platform is required which provides: support, device discovery, asset management, device configuration, device updates and security management such as Mobile Device Management (MDM). This document provides guidance for centralized IoT management comparison to MDM. Also security threats of IoTs based on infrastructure, communication protocol; compare HTML and SOAP message based. Show new direction to manage IoTs by lowering existing security risks.

Péter Fejes-Tóth: *How important is encyclopaedic knowledge in mathematics?*

During recent years, as smart-phones and other ICT tools became widespread, information became very easy to access instantly. This deteriorates the value of encyclopaedic knowledge and has widespread effects on mathematical education. I deal with these phenomena by addressing questions like what kind of mathematical knowledge should be our aim to pass to students, by using/encouraging/allowing what kind of ICT tools. It is hard to determine what knowledge is reasonable to require to learning by heart. On one hand, some level of knowledge, like the skill to conduct basic operations or to be familiar with contextual issues is inevitable. On the other hand, if - instead of focusing on requirements - education embraced the possibilities provided by freely accessible data and information, much more complex and elaborated areas of mathematics could become available. In practice, it is also a question what kinds of tools are to be "let in" to education, and how can be the offline and the online integrated for the greatest gain possible.

Andrej Ferko: *Local and global interestingness in virtual time for teaching using wrong metaphors*

We present an authoring method how to create locally and globally interesting teaching in a relatively short time. The overview of necessary notions includes virtual time, bisociation, energy of mistake, depth of immersion, and enthymeme. We discuss the usability of the approach in diverse applications, like measuring of engagement in a virtual museum or teaching polygon triangulation using wrong metaphors.

Katalin Fried: *Why don't we tell the entire truth to our children?*

In mathematics, and in other fields of life, we often tell some facts to our children without revealing the entire background of it. This may have several

reasons. It is important to realize that this is happening, why this is happening and how it influences our children.

Katalin Földesi: *What geometry problems can be found in the problem repository of the elementary school part of Matematiklyft, and how are they used?*

To start with, I would like to present some important facts about Matematiklyft, which is a multi-year continuation course that is mandatory for all math teachers in Sweden. The importance of this continuation course is emphasized by it recently becoming the subject of mathematical didactical research. In my presentation I will investigate the geometry problems present in the problem repository, in particular with respect to the following: what percentage of the problems are geometry ones, the conceptual background of the problems, their linkage to other topics, whether the problems require construction or calculation, whether their solutions are open and how they are discussed in the repository. I will also attempt to draw some conclusions from this investigation.

Stefan Gubo: *Solving linear optimization tasks using computer applications*

An optimization task is a task of finding the best solution from the set of all possible solutions. Linear optimization is a method applicable for the solution of tasks in which the objective function appears as a linear function and the constraints can be described with linear equations and/or inequalities. In the presentation we illustrate how to use computer applications in solving such tasks. An optimization task is a task of finding the best solution from the set of all possible solutions. Linear optimization is a method applicable for the solution of tasks in which the objective function appears as a linear function and the constraints can be described with linear equations and/or inequalities. In the presentation we illustrate how to use computer applications in solving such tasks.

Ján Gunčaga - Robert Janiga: *Virtual laboratories in computer science education*

Significant development of information and communication technologies and especially the internet boom bring new possibilities in education of different school subjects at all levels of the educational process. Information technology has provided new innovations to sustain constructing an artificial educational environment by means of computers. Certain artificial environments sometimes go beyond natural environments, such as simulations and virtual reality, which is a sophisticated educational technology. A computer simulation which enables essential functions of laboratory experiments to be carried out on a computer is called a virtual laboratory. This simulation support aspect of visualization in

educational process in different school subjects and it is possible to use it in educational process in different study programs of teacher training at universities. Understanding of new notions through visualization belongs to important factors in the constructivist educational approach. We would like for this reason to present some aspects of visualization also through selected kinds of virtual labs. Laboratory distance education opens new challenges such as separation of imperfections in technology and teaching methodologies and development of assessment strategies that provide reliable feedback about student learning capabilities. Feedback from students and experts provided a lot of constructive comments and suggestions.

Ákos Győry: *On the geometrical thinking of secondary grammar school students based on a regional survey*

We monitored geometrical thinking of secondary grammar school students in Miskolc with the help of a test from the article Van Hiele Levels In Secondary School Geometry by Zalman Usiskin. We compared students' Van Hiele level and their achievement during lessons by tests' results and analyzed the year by year improvement. The tests were written in three different high schools with students from different classes. We obtained both global and local conclusions. We analyzed the systematically wrong answers of students of special math classes.

Lajos Hajdu: *Problems of using symbols during learning perimeter and area*

Exponential Diophantine equations, that is equations like

$$2 \cdot 3^{\alpha_1} + 5 \cdot 7^{\alpha_2} - 6 \cdot 11^{\alpha_3} \cdot 13^{\alpha_4} = 1$$

(with fixed integral bases and constants, and non-negative variables α_i in the exponents) appear in many types of problems, so it is not surprising that they have a long history. Here we only mention that though there are many deep results concerning such equations, there is no method known for bounding the variables α_i. Also, there is no algorithm available for the resolution of such equations in general. In our talk we present a heuristic method, based upon congruences, to find all solutions of exponential Diophantine equations. We explain why the method "should" always work. For this, we use Carmichael's λ function, and a famous result of Erdős, Pomerance and Schmutz about "small" values of λ. We illustrate the method with several examples, including the solution of a problem of Pohst about the representation of primes in the form $2^{\alpha_1} \pm 3^{\alpha_2}$, and finding all integers having only "few" non-zero digits in two fixed (multi-base) number systems parallelly.

SÁNDOR KÁNTOR: *Conventions of mathematical problems and their solutions*

Collecting and analyzing the conventions indispensable for interpreting mathematical problems and their solutions correctly assist successful education and objective evaluation. Many professional and didactic questions arose while collecting and analyzing these conventions, which needed clarification, therefore the materials involved concisely the conventions enrich both the theory and practice of mathematics teaching. In our research we concentrated mainly on the problems and solutions of the Hungarian school leaving examinations at secondary level in mathematics.

TÜNDE KÁNTOR: *A history of the honour doctoral awarding at the University of Debrecen (1912-2013)*

This factually substantiated overview offers, from the first time in the past century up to the present, a compilation of the names of distinguished university students who throughout their studies attained top grades in mathematics. A brief outline of the honour doctoral awards is followed by an overview of the varied history of distinguished promotion in Hungary and in Debrecen (promotio sub auspiciis Regis, promotio sub auspiciis Gubernatoris, promotio sub laurea Almae matris, promotio sub auspiciis Rei Publicae Popularis, promotio sub auspiciis Praesidentis Rei Publicae). Finally we are given an opportunity to get acquainted with the survey of the activity of distinguished honour doctors.

ILDIKÓ KÉZÉR: *Some problems on the sum-of-divisors function*

We investigate some problems related to the distribution of the divisors of a number in different residue classes. We denote by $f(n)$ the ratio $\frac{\sum d}{\sum d'}$, where the sums are extended for all divisors d, d' of n such that $d \equiv -1 \pmod 3$ and $d' \equiv 1 \pmod 3$. We examine the range of $f(n)$. We show that $f(n) \neq 1$, and characterize the values of n, for which $f(n) > 1$ and $f(n) < 1$, resp. We verify that $f(n)$ can assume arbitrarily large and arbitrarily small positive numbers, as well. We exhibit infinitely many numbers c for which $f(n) = c$ has infinitely many solutions in n. We discuss also some generalizations and unsolved problems. In the proofs we use elementary methods that mostly can be discussed in secondary school, mainly within the framework of group study sessions and we do think that observing these types of questions gives children a chance to make some experimentations, and we show how we can use several mathematical softwares in these discoveries.

Anna Klingné-Takács: *GEOMATECH competition - Mathematics and physics*

GEOMATECH competition - Mathematics and physics In January 2014 a unique education development project was started, initiated by BKF Communicational Foundation, University of Applied Sciences, Budapest, and GeoGebra Non-profit Ltd. Initiation GEOMATECH is to be realized in the framework of a TÁMOP Program of New Széchenyi Plan. Its aim is to have children take a liking to Mathematics and Sciences, to get them motivated in studying these subjects. GEOMATECH competition is a playful Maths and Science contest, not a traditional educational competition. The 1-5-member groups got new tasks every month according to their age-category (grades 1-12 are divided into 6 age-categories), and they use one of the most popular, free educational software, Geogebra, to solve the problems; it is easy to use, helps to understand abstract concepts with spectacular visual elements and develops students' computer knowledge in a playful way. In our lecture we present the experiences of the competition, we show the wittiest, most creative solutions of the first rounds.

Lilla Korenová: *The GEOMATECH project from a reviewer's perspective*

The GEOMATECH project was developing high-quality teaching and learning materials for all grades in primary and secondary schools in Hungary (`http://tananyag.geomatech.hu/`). In addition to material development, project offering 60-hour professional development courses for more than 2400 teachers in 800 schools in Hungary. The technology background of the project is offered by GeoGebra, which is an open-source, dynamic mathematics software widely used around the world. In the framework of our presentation, besides introducing GEOMATECH, we will compare it to other large education development projects from the Central-European region, which are using GeoGebra, such as the Slovakian EMATIK projects.

Zoltán Kovács: *Can you learn mathematical problem solving?*

As instructor I often encounter the fact that many of prospective math teachers are not able to solve even moderately challenging mathematical problems. Similar experiences may led to the fact, that Hungarian mathematics teacher education program specifies a problem-solving seminar, aimed for the heuristic problem-solving strategies. In this talk I discuss the possible causes of the immature problem-solving skills and report on my experiences obtained during problem-solving seminars and outline an idea of the content of the course. The basic components: complex problems, open-ended tasks and reading Pólya.

Péter Körtesi: *Famous curves revisited with GeoGebra*

One of the applications of the MacTutor History of Mathematics is the Famous curves index, which contains the frequently used curves and associated curves. The GeoGebra tools are suitable in the study of the given curves, and to represent them with their associated curves as well.

Anita Misetáné-Burján: *Chess and mathematics*

A frequent application of pedagogical measurements is the measurement of the skill level. Since 2004 Hungarian high schools may require a central admission exam from the students in case of application for 9th grade. This measurement in the borderline of primary and secondary education could be considered as a milestone. The "School Users" (parents, pupils, and teachers) have the common goal that 8th graders should show off the best of their knowledge in this two 45 minute periods. With the help of the KÖZFELVIR 2014 database we carried out an empiric research in which we analyzed the exercises of the mathematical admission exam in the aspect of content and broken down to mathematical competences countrywide and at a group of chess players. We observed the improvement of the thinking and problem solving skills in practice by connecting "the queen of science" (mathematics) and "the royal game" (chess) in the process of education. In my presentation I would like to present the results of the research.

Ilona Oláhné-Téglási: *Place of logical games in mathematics education*

General problem in mathematics education is the lack or absent of motivation. This is acutely valid for secondary school age: most of the students alienate from mathematics, think it is too difficult, dry, boring. Methodological researches prove that the attitude towards a subject has significant influence on the effectiveness of learning. As George Polya said, "A teacher of mathematics has to be a good salesman to be able to sell his merchandise to the buyer." Logical games are often based upon a mathematical structure. They can develop skills and abilities that are important parts of mathematical thinking and mathematical competences. If we take advantage of them, and find the relevant game to a field of mathematics, we can use it on mathematics lessons. In my lecture I'd like to show some examples how we can use logical games at concrete fields of mathematics. Beyond the possibility of motivation through playing I will show which skills and abilities they can develop, and furthermore, we can develop problem solving skills and mathematical model making.

Edita Partová: *The supporting and retarding role of demonstration in primary mathematics education*

The demonstration is one of the fundamental principle of the didactic principles which has been used in schools from age of Comenius. At the same time we must not forget the other didactic principle either, as the gradation or adherence to the age characteristics. Teaching of mathematics as an abstract subject is the illustration of a decisive role of representation, especially in the primary school. Is not negligible, what model is chosen during the demonstration, since the non-appropriate model can cause the deformation of the term. It is important age-appropriate model, but also the amount of the demonstration. The demonstration, what is in early childhood very helpful, later may delay the development of abstract thinking. In the presentation we show examples illustrate the correct, incorrect or unnecessary types of representation.

Erika Perge: *Improving color aptitude by educational software*

The ability to handle colors smoothly and consciously may be vital to professionals in various fields, including architecture or design. My aim is to demonstrate how to apply various electronic tools effectively in the process of teaching and learning color theory, as well as cultivating students' ability to recognize, distinguish and define colors. I introduce new features and updates of my self-developed software, which has been tested as a tool for teaching color theory to future practitioners of various professions at the University of Debrecen, Faculty of Civil Engineering, as well as Medgyessy Ferenc Grammar School and Secondary School of Arts. Results of our study conducted in the past four years support the efficiency of the software.

Ildikó Perjésiné-Hámori: *Computer algebra as a didactical tool in engineering education*

In our research group at the University of Pécs Faculty of Engineering and Information Technology didactical projects are dealing with the role of computer algebra in teaching mathematics. We reflected on how the systemic use of technology can connect the blended learning methods and CAS how can we use internet in mathematics education and how it is used for different topics of mathematics. Our experience is that CAS is source, medium, and generator of mathematics teaching. Integrating CAS into education needs: human, psychological and didactical objectives rather than a technical-centred approach. In the engineering education during Mathematics courses students have to synthesize and apply the

basic mathematical concepts in a different way, to rebuild the knowledge representation net, to generalize mathematical concepts, to connect various topics of mathematics. Students have to become closer to know how to apply the knowledge in everyday in engineering. In our lecture we present some examples from the course material and present some sample test questions using Maple T. A. test and assessment system.

Ildikó Pomuczné-Nagy: *"Can we do physics without problem-solving skills in maths?"*

In my lecture I list problem-solving brain boosting mathematical tasks which are inevitable for learning physics. I make groups of the physics tasks according to the mathematics problems without some problem-solving or the advanced-level tasks in physics can't be done. I made my 9th-class students do primary-school-level tasks grouped according to the above points. In my lecture I would like to demonstrate the results of my research, and to point out that the success of studies in physics can be attributed to the necessity to improve the problem-solving skills in mathematics at the proper age. - "There is no success in physics without improving the problem solving skills in maths."

Veronika Stoffová - Krisztina Czakóová: *How to prepare and introduce a new subject into the teacher training curriculum*

Only a well experienced educator can create a good long-term concept of teacher training for primary and secondary schools and prepare the documentation of the new study program or a new line of innovative curriculum. Often, however, even less experienced teachers are entrusted with the development and introduction of a new subject in undergraduate study program. How to deal with such a role and how to successfully complete the implementation of the subject into the study program are trying to advise and pass their own long experience the lecturers.

Gyöngyi Szanyi: *The impacts of the introduction of the function concept on students' rule following and rule recognition skills*

The concept of function is fundamental importance to the learning of mathematics. In the function concept development process the rule following and rule recognition skills have an important role in order to be able to recognize function-like relations between quantities. After introducing the function concept, the skills mentioned above were tested among seventh grade students from Ukrainian and Hungarian schools. Then consequences have been compared to results of previous investigation (before introducing the function concept) among the same students.

In the presentation we show our experiences and we discuss the impacts of the introduction of the function concept on the rule following and rule recognition skills.

Janka Szeibert - Csilla Gyöngyvér Zámbó: *The timeline of abstraction in algebra*

Algebra is (one of) the most abstract subject(s) of prospective teachers of mathematics. We investigate when abstract ideas become conscious in students' minds and for how long they remain there. We also examine how students can acquire long-term knowledge. The initial assumption of our research that in case of abstract algebra the latent learning requires more time than concerning other subjects so achieving intuition becomes a longer process. We think that learning strategies and proper time arrangement can help gaining long-term knowledge and abstract skills. We report on an experiment based on these hypotheses and present our results.

Judit T. Nagy: *Evaluation of the use of interactive videos based on the Technology Acceptance Model*

The study is part of a longer series of studies in which we examine the effect of the usage of interactive educational videos compiled for mathematics courses in higher education. In this part, using the Technology Acceptance Model (TAM), I study the correlations of the students' attitude and behaviour while using videos. The research model is based on the first modified version of TAM in which beside the original variables (perceived usefulness, perceived ease of use, attitude toward using, intention to use), I introduced satisfaction and interaction as mediator variables as well as internet self-efficacy, computer self-efficacy, self-regulated learning and GPA as external variables. The results confirmed the findings of the original TAM and verified the explanatory force of satisfaction, learner-teacher interaction, internet self-efficacy and GPA.

Ildikó Tóth: *Spherical geometry in the classroom*

The topic of my lecture is the integration of spherical geometry into the higher classes of primary school and into the secondary school classroom. Teaching Euclidean and non-Euclidean geometry in a comparative method, we can introduce the students into a completely new geometric world while involving them actively in several experiments. This experience can effectively raise and keep up the students' interest in geometry. Comparing the two geometries creates a deeper understanding of the concepts in the plane, generates the need for proofs and develops openness to distinct mathematical models. In my presentation I show

how to use the transparent Lénárt-sphere for manipulative activities in the class room and how to complement these activities with digital illustrations.

József Udvaros: *Modeling class, object and inheritance terms by the software*

Nowadays almost every computer program operates on the object-oriented principle, what programmers create using object-oriented (OO) programming languages. For application developers it is essential to master the object-oriented thinking. Teachers of programming debate about how and by what means can be OO thinking acquired as fast as it is possible, and whether it is right to start teaching programming OO environment from the first moment. Teachers not only in Europe, but throughout the world have the same very similar views that OO programming is not possible to learn just through using the programming language commands and it cannot be successful without planning OO programming. In this talk the author presents visual software created by himself, which helps students to understand some basic terms about OO programming. The software models class, object and inheritance terms. Author also evaluates questionnaires filled in by students.

Attila Vámosi - Imre Kocsis - Adrienn Vinczéné-Varga: *Analysis of the engineering students' working strategies on the basis of an online test*

Online tests provide a wide variety of analytical methods for evaluation of students' knowledge and their working strategy. Automatic question generation and evaluation have several well-known advantages from the instructor's point of view, e.g. flexibility and time-savings, but there are further possibilities created by well-designed software for the evaluation of the teaching process efficiency and for the analysis of motivation and working method of students. Students can be classified on the basis of their activity on the site (registered login times, logout times, working times; number of attempts, etc.). Special purpose software was developed and applied in a physics course of the Mechanical Engineering training program at University of Debrecen. Evaluation of the results is presented in the talk.

Ladislav Végh: *Interactive animations in teaching and learning computer science algorithms*

Learning programming is one of the hardest tasks for first-year computer science students. They need four types of knowledge for writing programs: basic mathematical knowledge, knowledge of using the IDE, knowledge of the commands and syntax of the programming language, and knowledge to transform the problem into the logic of the program. For the last one, it is necessary for

students to be familiar with some of the known algorithms. However, to understand an algorithm is not easy for beginner programmers, because they use abstract concepts. Algorithm animations might create a bridge between these abstract concepts and real life situations. They can be especially helpful when students are active participants of these animations. To help students and teachers, we created a portal (www.algoanim.ide.sk), where we have tried to collect and categorize interactive algorithm animations and visualizations.

Margareta Végh: *The use of the cooperative method called Gallery walk in a mathematics classroom*

Besides efficiently solving exercises, the quality of the course of thoughts is very important. Another important aspect concerns the students' motivation while solving exercises. The aim of my presentation is to introduce a cooperative form of work and the efficiency of two cooperative classes. I used the Gallery walk method with sixth graders, the topic of the first lesson being prime factorization, respectively the calculation of the highest common factor and the lowest common multiple. The topic of the next cooperative lesson was operations with fractions.

Erika Veres: *Care of gifted in Beregszász - First steps in the research*

In September 2015 I began my studies at the Doctoral School of Mathematics and Computer Sciences of University of Debrecen. In addition, I teach in Ferenc Rakoczi II. Higher Vocational Educational Institution of the Transcarpathian Hungarian Institute. In my presentation I'll show you a few samples from my first attempts. More specifically I want to present study group exercises which I selected for the 8th class for the second round of Ukrainian Mathematics Competition 2015. I'll show you the solution of the tasks and the analysis too.

Adrienn Vinczéné-Varga - Imre Kocsis - Attila Vámosi: *Experiences with using mathematical software*

Mathematical computations are dominated by a wide range of software in many areas of engineering science and education. In an ideal case the user has precise knowledge about the mathematical process in the background. Among others one should be able to keep the results under strict control. In this talk we would like to present some examples where such a theoretical checking is unavoidable to avoid false results.

Márton Visnovitz: *Aspects for choosing a programming language for education*

Implementing algorithms is an integral part of teaching programming and data modeling in high school. For this the teacher has to choose a programming

language to use. Choosing the right language and development environment is of decisive importance for having an effective and useful teaching process. I created a list of aspects of textual programming languages that we have to take into consideration when choosing. For languages commonly used in high school education I examined how well they do in terms of these aspects. Based on the results I listed the pros and cons for groups of languages.

Gergely Wintsche: *Concept building in probability theory*

Understanding and proper usage of a concept is momentous in teaching. It is vitally important that the teacher and also the students can make difference between the everyday meaning and the mathematical meaning of a concept. I give a short description about the similarities and differences of the problem solving process among different students groups. We deal with difference between the sure event and a very high probability event moreover the difference between the impossible event and a very small probability event. We deal with the ability of precise usage of these concepts.

Zoltán Zakota: *Why and how should we teach information and communication technologies at the universities?*

Although today one can hardly find a school without informatics in its curriculum, the level of the students' knowledge in this field is surprisingly low. This is valid when talking about theoretical notions, but students are also missing the greater picture, which could show the inner connections between the different fields and the relations to other domains. Even the name of the discipline is misleading being usually called informatics, despite it usually contains basic notions of computer science. The curriculum often contains only the presentation of some elements of the Microsoft Office software package, a very comfortable solution for both teacher and students. In my presentation, I intend to outline some main motives to keep informatics and computer science, respectively communication technology basics in the curriculum.

List of abstracts of posters

Sándor Dobos: *Addition to the presentation "Management of Internet of Things in the enterprise environment"*

Addition to the presentation by reviewing the IoT trends, communication of these devices and security challenges. Comparison of the REST and SOAP

based protocols. Recommendations how to integrate IoTs into Mobile Device Management within the Enterprise. Summarizing the recommended guidance in order to meet regulatory requirements.

Roman Horváth: *Why are we returning from Java to the Pascal language?*

We started to use the Java language in introductory programming courses in 2009. Continuously we improved the introductory course tools but continuously we noticed some issues in students' understanding of the teaching materials. Now, in 2015, we attempted to return back to use the Pascal language within the teaching process. We expect that the understanding of teaching materials will be easier, faster and will last for longer time. First indices about positive effect come from evaluating of written exams of two groups. The first group is formed of first year students learning Pascal and the second group is formed by second year students learning Java.use interface. We are mainly interested in numerical computations. The problems we are going to solve are typical in engineering education. They allow us to compare the tools of different software packages in practice.

Tünde Kántor: *A history of the honour doctoral awarding at the University of Debrecen (1912-2013)*

On the poster we shall present a valuable part of the disquisition with documents and pictorial material representing flashes of rare moments.

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