

## ABSTRACTS:

### *Novi Sad—Szeged Winter School on*

### **Non-Standard Forms of Teaching Mathematics and Physics: Experimental and Modeling Approach**

*Novi Sad, February 6<sup>th</sup> –8<sup>th</sup>, 2015*

#### **Friday, February 6<sup>th</sup>, 2015**

*János Karsai, University of Szeged*

##### **Teaching Math for Applied Sciences**

Most benefit with less effort; this is a common reasoning in applied sciences while learning Mathematics. Deep theories are needed but there is no time for deep study. What is the reason that the math teachers and applied students do not understand each other? Do they speak different languages?

In our talk, we will present some examples, didactic concerns as well as our experiences of using dynamic applications in the math courses given for life sciences. We emphasize the importance of complex modeling approach.

*Marko Nedeljkov, University of Novi Sad*

##### **Mathematical modeling in Physics**

In a time when modern science is born, mathematics and physics were together. Due to a massive development of the sciences in the last century, and use of different "languages" in each of them, even two areas in each of them looks quite separated. We shall present some simple examples connecting the continuum physics and mathematical analysis to show how they are close and beneficial to each other.

*Mirjana Mikalački, University of Novi Sad*

##### **Positional games**

Positional games are perfect information games played in turns by two players who alternately claim unclaimed elements of the given board. In this talk we will speak about two different types of positional games - strong games and Maker-Breaker games.

*Kristina Siladji, High School J. J. Zmaj, Novi Sad*

##### **On the Impossibility of Some Geometrical Constructions**

In this talk, we will discuss the impossibility of solving the three ancient geometrical problems: squaring the circle, doubling the cube and angle trisection. Even though they seem easy and understandable to everyone, these problems remained unsolved for more than two millenia. It turns out that the reasons for the impossibility are algebraic, which is why they were settled as late as XIX century. In this talk, we will outline the main algebraic ideas which are used in these proofs. These include linear algebra, field extensions and algebraic number theory. It is interesting that this approach also enables us to prove the possibility or impossibility of other geometrical constructions.

*Jovan Jeromela, High School J. J. Zmaj, Novi Sad,*

##### **On the visualization of definite integral**

We present the visualiyation of the definition of definite integral in the GeoGebra enviroment.

*Stojan Važić, High School J. J. Zmaj, Novi Sad,*

### **Database in Java**

We will show the basic functions of the database in Java.

*Nikola Zeljković, High School J. J. Zmaj, Novi Sad,*

### **Information system for trade business support**

We will show the basic functions of trade business support.

The teachers:

*Tatjana Stanković , Nada Ranković, and Ljiljana Djuretanović and students Žutić Matija, Zeljković Miljana, Slović Milica, Ivanovski Marija, Nikola Popov, Aleksandar Ćirić from Electrotechnic School "Nikola Tesla", Economic and Trade School "Paja Marganović" and Technical School "23. Maj, from Pančevo,*

**Platonic solids in ecology, electrical engineering and economics- lesson review.**  
will be presented.

## **Saturday, February 7<sup>th</sup>, 2015**

*Srdjan Skrbić, University of Novi Sad*

### **Parallel scientific computing at the University of Novi Sad**

Scientific computing research group at the University of Novi Sad was founded in 2012 with the idea to create a forum for exchange of ideas that will gather practitioners in the field. Within the group, there are two main directions of research related to parallel computing. The first one is concentrated around problems of quantum physics and their solutions using parallel computers in cooperation with the Institute of Physics in Belgrade. Currently we are working on density functional theory problems and modeling Bose-Einstein condensates using the Gross-Pitaevskii equation. In cooperation with EPFL, Switzerland, we started the other direction related to improving performance of R programming language by creating completely new implementation, that relies on abstract syntax tree of the FastR project and uses LMS, OptiML and Delite to generate parallel code.

*Sanja Konjik, University of Novi Sad*

### **The properties of fractional calculus**

We present the introduction to fractional integral, derivative and their most important properties and examples.

*Đurđica Takači, University of Novi Sad, Ivana Milanović, High School Isidora Sekulić, Novi Sad*

### **Function given integral, visualization of fractional calculus**

Workshop: The visualization of the definite integral, function given with definite integral, convolution, fractional integral and derivative and the solutions of fractional differential equations

*Gergely Röst, University of Szeged*

### **Take a shower like a mathematician! - an introduction to time delays**

From our everyday life in our homes to the global climate, the whole world around us is governed by feedbacks. In this talk we take the example of setting the optimal temperature to illustrate the effect of delayed negative feedback: how it can destroy stability and lead to oscillatory behaviour. Then we give a short introduction to the basics of the mathematical theory of delay differential equations, as well as their numerical and computer simulations.

*Olivera klisuric, University of Novi Sad*

### **Biopac Student Lab System**

The **Biopac Student Lab System** (BSL) helps to explain to students the fact that electricity is flowing throughout a living body at all times and that it is possible to use the signals to measure the performance and health of individual parts of the body. The Biopac Student Lab system was introduced in 1995 as a digital replacement for

aging chart recorders and oscilloscopes that were widely used in undergraduate teaching laboratories. The advent of low cost personal computers meant that older analog technologies could be replaced with powerful and less expensive computerized alternatives. Students in undergraduate teaching labs use the BSL system to record data from their own bodies, animals or tissue preparations. The BSL system integrates hardware, software and curriculum materials including over sixty experiments that students use to study the cardiovascular system, muscles, pulmonary function, autonomic nervous system, and the brain.

*Maria Vittoria Barbarossa, University of Szeged,*

### **Introduction to Mathematical Epidemiology**

- What does mathematical epidemiology mean?
- Short history of mathematical epidemiology.
- Different diseases, different models: an overview
- Case studies

*Kyeongah Nah, University of Szeged*

### **Mathematical modelling of vector-borne disease**

Several serious diseases (e.x. Malaria or West Nile virus) are transmitted by vectors, such as insects or ticks. The vectors transmit pathogens or parasites from one infected person to another. In general, vector populations are anticipated to increase as a result of climate change, and so is the incidence of vector-borne diseases. Mathematical modelling is a useful tool for the successful control of such diseases, since their intuitive assessment is often difficult. In this talk, I introduce the Ross-Macdonald malaria model, the earliest study on the dynamics of vector-borne transmission. We present the mathematical analysis of the model, and discuss the biological implication of the results. In the second part of the talk, some applications of vector-borne disease models to current public health problems are shown.

*Eva Jungabel, University of Novi Sad,*

### **On homomorphism-homogeneous point-line geometries II**

In this talk we discuss one class of homomorphism-homogeneous point-line geometries.

*Jelena Tatar, High School J. J. Zmaj, Novi Sad*

### **Transformation of functions**

We present the shifting, reflecting and stretching of the graphs of functions, with simultaneously connections with the corresponding analytical expressions.

*Radoslav Božić, University of Novi Sad,*

### **Dinamic geometry and parametric presentation of functions**

We present the parametric presentation of functions in the GeoGebra and Mathematica environment.

*Valentina Kostić, Grammar School Piroć, Tanja Sekulić, Technical College of Applied Sciences, Zrenjanin*

### **Mathematical modeling in physics education**

This paper presents one way of mathematical modeling integration in physics education. The process of mathematical modeling is implemented using a visualization method carried out with the help of dynamic software GeoGebra.

We also discussed two mathematical models carried out in GeoGebra which may be used for realization of teaching units related to the uniform movement and movement problems.

*Tatjana Stanković, Zoran Radović, University of Belgrade*

### **1+1=????**

Modern teaching of mathematics is directed towards practical applications. It is necessary to enable pupils to apply different fields' knowledge in solving practical problems. Mathematical logic (the propositional calculus) has an important application in electrical engineering practice. The question is can electrical engineering be used in

learning the propositional calculus? Could passive learning of truth tables be turned into active learning by reinvention method ? If so, how can it be done?

*Aleksandar Milenković, University of Novi Sad,*

### **Mathematical modelling with Mathematica**

We present two examples of mathematical modelling in teaching mathematics and physics by using package Mathematica.

*Marina Jokić, University of Novi Sad,*

### **Solving mathematical problems with the help of dynamic software**

We present the use of dynamic software in defining and solving some mathematical problems by applying G.Poly's model and Van Hiele's model of learning geometry applied in the school in Krusevac.

*Mirjana Jovanovic, High School Isidora Sekulić, Novi Sad*

### **Mathematical modelling**

We present the concept of a quadratic relationship related to problem posing and solving. Some optimization problems based on the application of quadratic function in sciences are solved and visualized by using package GeoGebra.

## ***Sunday, February 8<sup>th</sup>, 2015.***

*Đurđica Takači, University of Novi Sad, Gordana Stankov, Subotica Tech – College of Applied Sciences, Subotica, Ivana Milanović, High school Isidora Sekulić, Novi Sad,*

### **Examining functions-collaborative learning**

We present the students analysis of the properties of the function by using formulas (limits, derivatives, equations and so on) and the corresponding graphs simultaneously in GeoGebra environment.

*Vladimir Francisti, University of Novi Sad,*

### **The Platform for Initial Test of Students Knowledge**

We present an analysis tool for development of education and teaching practice, using modern platform designed specifically for the needs of initial testing knowledge and abilities of students. Particular attention will be directed towards defining analytical reports which will be able to obtain on the basis of information and material that the software collects.

*Attila Mader, University of Szeged,*

### **Tablets as a tool for learning**

We present the didactical background of mobile applications for teaching and learning mathematics. Mobile tools are introduced in the classroom and the didactic role of different games (as Clever Blocks, Entangled Game, One touch draw, Water logic, Math vs. Undeads, Math vs. Dinos, Math Duel, Math Workout, Paperama, Quarto, Plague Inc., ...) is analyzed.

*Peter Eszteleczki, Gábor Kőrösi, High School Boyai, Senta*

### **E-learning and M-learning in Serbia and abroad (presentation of a self-developed educational framework system)**

Nowadays the education of computer science has changed from its core, thinking of the technological development, change in curriculum, and the changes in the attitude of teachers and students towards school and education in general. We are searching for the answer of which changes facilitated actions the education of computer science towards less traditional ways of teaching.