



International Conference “Science Education in School” – 4th edition Abstracts of conference presentations and workshops Speakers’ profile

Ana Gostinčar Blagotinšek

CV

Ana Gostinčar Blagotinšek is a lecturer and research associate at the Faculty of Education, University of Ljubljana, Slovenia. She started her career as a physics teacher, but was later invited to work at the Faculty of Education, where she works with future and in-service kindergarten, primary and physics teachers. Previously, her research field were liquid crystals, and she studied possibilities to implement them in education. In the recent years, she focused on primary science and especially inquiry-based methods of science education. She was the national coordinator of The Fibonacci Project in Slovenia.

Abstract of presentation: Enhancing science learning by IBSE

Science has been increasingly unpopular with pupils and teachers, public esteem of science is low and our technologically advanced society is in danger of stagnation, if negative trends are not reversed. Experts agree that educational system is (partly) to blame for the unfavourable situation, but it can also provide solutions. Introducing IBSE to schools (and kindergartens) seems to be the right thing. Research shows that implementing IBSE improves teachers’ and pupils’ attitudes towards science and facilitates learning with understanding. To implement IBSE in the classrooms, introducing this approach to both pre- and in-service teacher education is needed. They need practice in conducting inquiries themselves and practice in guiding pupils to do it. As this is no easy task, support from mentors and colleagues is very valuable. Experience with introducing IBSE to Slovenian schools and kindergartens will be shared.

Abstract of workshop: Light and colour

We will study light phenomena (absorption and reflection) through play and simple experiments. Shadows (grey and coloured), mirror images and multiple reflections will be observed and investigated. Activities enable experiential learning of the law of reflection, image formation and symmetry and are suitable for stages K – 5.

Ed van den Berg

CV

Ed van den Berg (1951) currently holds appointments in secondary physics teacher education at the Vrije Universiteit (Amsterdam) and in primary teacher education at the Hogeschool van Amsterdam. In the past Ed studied Physics (MS) in the Netherlands and Science Education in the USA (PhD); taught high school physics; worked for Unesco in Kenya; and assisted in the development and teaching of Science Teacher Education programs in Indonesia (1981-1991) and the Philippines (1996-2002). From 1991-1995 and 2002 – present Ed worked as physics teacher educator and developer at several Dutch universities. He published on physics teacher education, use of the laboratory in physics, fast feedback formative assessment, and served on the editorial boards of the JRST, ISJE, and the J of Sc T Ed.

Abstract of presentation: Inquiry Based Science Education, manipulating equipment or manipulating ideas, hands-on or minds-on?

Inquiry involves wondering and raising questions, using observations, planning and carrying out investigations (not just observing and measuring), proposing explanations and solutions, and critically evaluating the investigation. Both old (Lunetta & Tamir, 1981) and new science education research (Abrahams & Millar, 2008) shows that too often laboratory activities in schools require only measurements and observations following cookbook recipes. Students manipulate equipment but fail to manipulate ideas. The lab activities are hands-on but not minds-on. How can we make simple modifications to our laboratory lessons so that they become more minds-on? How can we guide the students in the classroom to use minds and hands rather than use hands only?

Abstract of workshop: “Experimenting” with concept cartoons

Concept cartoons can be used to diagnose misconceptions and stimulate discussion of basic concepts and phenomena. However, the teacher can also present a cartoon and then ask students to think of experiments to further investigate the phenomenon shown in the cartoon. Our experience is that students from age 9 -18 very quickly come with creative ideas and start investigations. That is, of course, only the beginning. The teacher will have to follow the work of the students closely and help them to develop their investigation skills and critical thinking. In the workshop you will experience how to start an investigation with the cartoon and then we will focus on how to use formative assessment to improve the work of students.

Toni Chehlarova

CV

Toni Chehlarova is a senior researcher at the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences. She is involved in mathematics education by teaching students from 1st to 12th grade and training teachers-to-be. She delivers courses in Mathematical Didactics, Methods in Teaching Mathematics, Methodology of the Pedagogical Research, Methods of Problem Solving, Implementing ICT in Education. Toni Chehlarova has about 140 publications and participated in about 60 conferences and workshops. She took part in research projects as a team member.

Abstract of presentation: IT in support of the inquiry based approach in learning mathematics 1-12 grades

Computer learning environments in support of the inquiry based mathematic education will be considered with a focus on

- integrating various means for representation of mathematical objects
- reformulating mathematical problems so as to provoke generation of hypotheses
- best practices from Bulgarian *Fibonacci* schools having implemented the IBL

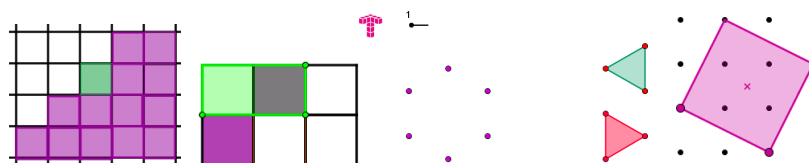
Dynamic resources, created by *Geogebra* and the *Elica* applications: *Cubix editor*, *Origami net*, *Math Wheel* could be found at <http://www.math.bas.bg/omi/Fibonacci/archive.htm>

Abstract of workshop: Dynamic environments and manipulatives in support of the IBL for 1-4th grade

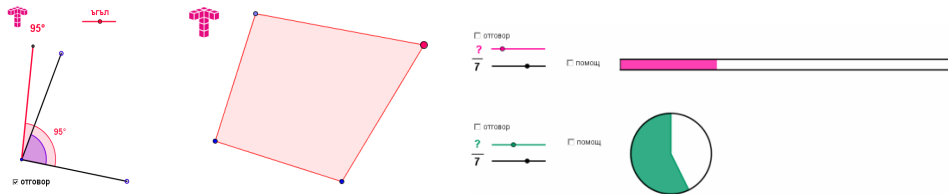
The focus of the workshop is on the integration of manipulatives, printed materials and virtual learning environments in support of mathematics explorations.

The dynamic files are implemented in *Geogebra*. The following problems will be presented:

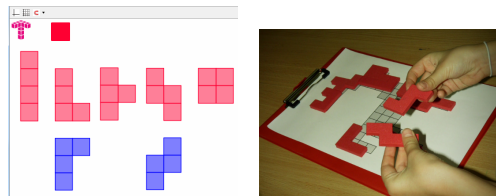
- exploratory problems with constructions in square and triangular grid



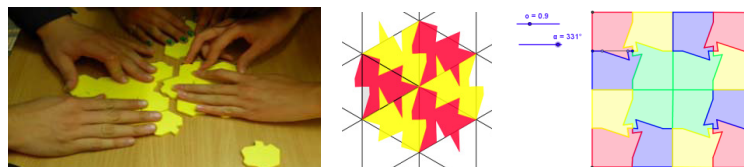
- improving your eye-measurements (by means of geometry figures, clock, fractions)



- explorations by means of polyomino



- tessellations of the plane in the style of Escher



Dynamic educational resources could be found at <http://www.math.bas.bg/omi/Fibonacci/archive.htm>

Suzanne Kapelari

CV

Dr. Suzanne Kapelari has studied Biology and Biology Teacher Education and did her Doctorate in Zoology. Since 2005 she has been working as teacher, teacher educator, science education researcher, Head of Education at the University Botanic Gardens and Head of Science Education at Innsbruck University, Austria. Her research interest is in “Inquiry Based Science Learning” and “Science Learning Outside the Classroom”, with a particular focus on learning at Botanic Gardens. She has been working in a couple of national and international educational projects (e.g. www.plantsafe.net) already and is currently co-ordinator of the European Project “INQUIRE” (www.inquirybotnay.org).

Abstract of presentation: Investigating Plants - Inquiry based science learning for a sustainable future

The European 7th framework INQUIRE network is currently developing and offering a one-year inquiry-based training course that will reach out to hundreds of teachers and Botanic Garden educators, and in turn thousands of children, in 11 European countries. The course is currently running in 14 Botanic Gardens and Natural History Museums - some of Europe’s most inspirational cultural and learning institutions. These places act as catalysts, training and supporting teachers and educators together to develop their proficiency in inquiry and out of school learning as well as to become reflective practitioners. Biodiversity loss and climate change are the major global issues of the 21st century and many teachers, as well as botanic garden educators, are looking for innovative ways to tackle these subjects. INQUIRE training supports teachers to do just that and introduce them to institutions where children can carry out ‘real’ investigations and see science in action.

Abstract of workshop: Hands on Botany - Inquiry based science learning activities for 8-13 year olds

This workshop will provide an insight into a couple of inquiry based activities which focus on plants. Currently science teachers around the globe tend to emphasise animal biology – feeling less than confident teaching about plants and their habitats. However, in today’s world of climate change and loss of our natural resources, it is vital that plant science and the need for their conservation are both understood and engaged in. Materials used encourage a ‘hands-on, brains-on’ approach to the

pedagogy, integrating methodology that would help the development of critical thinking skills e.g. argumentation and discussion and to encourage children to really 'work like scientists'.

Dragana Milicic

CV

Dragana Milicic is assistant professor at the Faculty of Biology, University of Belgrade. She is involved in accredited programs of professional development in teaching, especially in pre- and primary school. She is author of text books in Biology for the 6th grade. She has been working in several national and international educational projects and published scientific papers.

Abstract of presentation: Experience in the application of IBSE method in teaching science in Serbia

The IBSE (Inquiry-Based Science Education) method in Primary schools aims to spread and popularize approach in the acquisition of knowledge through research, experimentation and discussion. The method is known and applied in Serbia since 2001. From 2003 it has being implemented in schools through the optional course „Hands on – Discovering the world“ for children 6 to 8 years old. Project aimed at renovating science education in Serbian elementary schools, and allowing exchanges and enhancing the development of good practices: teacher's training, evaluation, on-line projects and dissemination. This method was also implemented through the European network for development and expansion of this concept of education, as part of EU-FP7-Fibonacci Project. Information of IBSE in Serbia is available through two internet domains (<http://rukautestu.vinca.rs> and <http://www.rukautestu.rs>), where teachers could find many facilities and books if they opted for practice such approach at the classes. Project is also supported by a number of official institutions in Serbia.

Abstract of workshop: "Nature by numbers" - Interdisciplinary Training Workshop for teachers in Primary Schools

The workshop will be conducted together with teacher Marina Drndarski

Subject matter of the workshop "Nature by numbers" is about the Fibonacci numbers and the golden (phi) ratio everywhere, which is a good method for personal, home, or classroom learning about nature, math, art and society. During this training, teachers are placed in the same pedagogical situation as children, and are being trained to implement this inquiry based science approach in their classrooms later. The workshop is intended to the primary school teachers, and proved to be a very good and popular way to raising interest of the students, given that it is rather interdisciplinary, and can be done by the inquiry method in elementary schools, even with the children in inclusion.

Nilgun Erentay

CV

Program Coordinator (Science Teacher)
Erentay Education Consulting, 06531, Ankara, Turkey

Abstract of presentation: Recognizing Nature's Wisdom through Science and Art: S.O.S. Project is Connecting Kids and Nature

Save Our Species (S.O.S.) is an ongoing environmental project that involves students from several primary schools in Turkey. The pilot study of the Project took start in 2005 Turkey with the participation of three schools, each of which is from Turkey, America and Romania. In 2013, number of the participant schools has risen up to forty.

Within the frame of the Project, there are two main focuses. These focuses are endangered species that are selected to be studied by the schools and the local habitats these species live in. At the beginning of the Project term, teams are constructed at each Project school. Study species and their local habitats, which are wetlands, are selected in the vicinity of the school area. Throughout the academic year, regular meetings are held, research is done, model ecosystems are designed at laboratories, field trips and water testing are conducted by the students and their teachers. The research and field trip data are shared online by all schools involved. At the beginning and at the end of Project term, pre and post tests are administered to the students involved in order to assess the

goals.

The proposed presentation will include a summary of Project implementations and the activities carried out by students and their teachers. It is hoped that these implementations and activities provide source for the people involved in environmental and scientific education worldwide.

Carmen Paduraru

CV

Occupation or position held: Lecturer PhD, Chemistry

Educational experience:

- Courses taught at undergraduate and master students.
- General Chemistry
- Drinking and industrial water technology.
- Ecology and environmental protection

Scientific activity:

- Books published by Publishing Houses recognised at national level: 5
- Articles published in international journals (ISI ranked): 23
- Articles published in journals indexed in the database: 17
- Scientific papers published in conference volumes: 15
- Projects / research contracts: 15
- 40 citation in international journals ISI ranked

Abstract of presentation: Development of teaching materials to deepen some issues of ecology and environmental protection for high school education

In the phase 1/2012 of the project type PCCA -2 "Inquiry-Based Education in Science and Technology" (Contract No. 223/2012), one of the objectives of the partner 1 - "Gheorghe Asachi" Technical University of Iasi- was the achievement of two educational films.

The films were designed to support teachers in the practical applications of the Environmental Protection and Natural Resources disciplines inside of 1,2 and 4 modules. The presented issues can be applied to classes X, XI and XIII from technical colleges and educational groups on technological branch. The films have a strong didactic character and shows briefly elements related to:

- environmental pollution in general and water pollution in particular and the need of preventing and combating them;
- water quality. laboratory analyzes;
- endowment of a laboratory for analysis;
- performing analyzes to assess the water quality.

The achieved films produced can be used by the teachers from the secondary education as demonstration lessons that emphasize the importance of experimental activities in deepening of concepts related to ecology and environmental protection.

Edith Saltiel

CV

- Maître de conférences honoraire au département de physique de l'université Paris Diderot.
- Thèse d'état en physique, mention didactique de la physique
- De 1999 à 2003, directrice de l'équipe La main à la pâte
- Participation aux programmes 2002 de l'école primaire, au DVD « apprendre la science et la technologie au collège », à l'évaluation bilan sciences de 2007

Actuellement,

- Membre du comité scientifique et pédagogique de la fondation
- A introduit depuis 2 ans un enseignement des sciences fondé sur l'investigation auprès d'enfants handicapés moteurs et/ou mentaux

Abstract of presentation: La main à la pâte en France: ses actions, ses projets

En 1995, 3% seulement des enseignants français à l'école primaire font des sciences, alors que les sciences sont inscrites dans les programmes scolaires. En 1996, 3 académiciens (G. Charpak, P. Léna et Y. Quéré) avec le Ministère de l'éducation nationale expérimentent un enseignement des sciences fondé sur l'investigation, appelé La main à la pâte. Un exemple sera donné.

Depuis 2012, La main à la pâte est une fondation de coopération scientifique qui a pour mission essentielle **d'aider les enseignants** à mettre en œuvre une pédagogie d'investigation. La fondation poursuit les actions menées par La main à la pâte : site Internet, ressources pour les enseignants et les formateurs, favoriser les interactions avec les scientifiques, créer des réseaux locaux avec les centres pilotes ainsi qu'un réseau international. Ces différentes actions seront rapidement décrites.

Avec la création de la Fondation, ont été créées quatre maisons régionales pour la science, maisons qui sont au service des professeurs afin de les aider à faire évoluer leurs pratiques d'enseignement des sciences. Pour ce faire, elles ont pour projet de proposer aux enseignants des actions de développement professionnel tout au long de leur carrière, aspect qui sera développé.

Abstract of workshop: "Un drôle d'œuf"

Les participants observent un phénomène scientifique et vivent une activité de formation qui est en partie centrée sur les liens qu'entretiennent science et langage : des écrits sont produits lors d'activités d'observation, de questionnement, d'argumentation et de communication ; leurs formes et rôles sont discutés dans le cadre d'un enseignement des sciences fondé sur l'investigation dont ils identifieront les caractéristiques principales

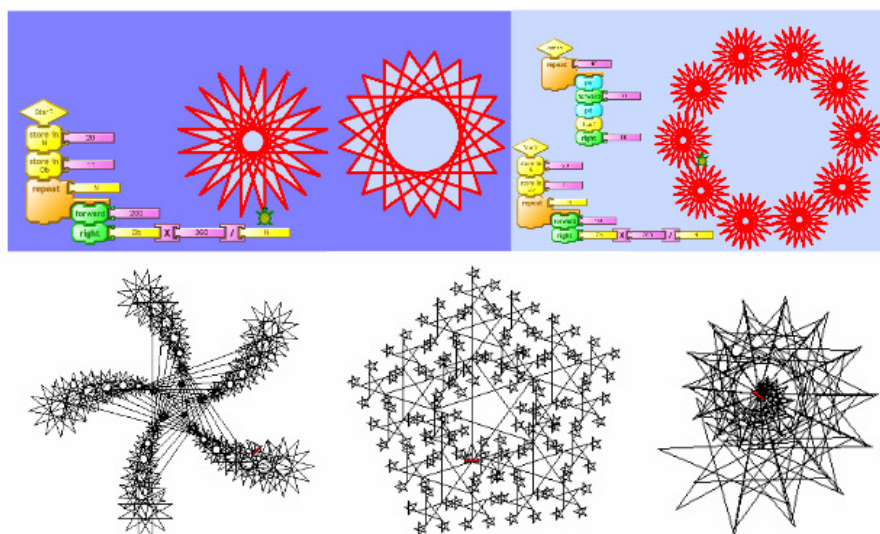
Evgenia Sendova

CV

Dr. Evgenia Sendova is associate professor (2002-2012) and Head of Department of Education in Mathematics and Informatics (2009-2012). She coordinated the Bulgarian collaboration with the US educational centre *Best Practices in Education*, developing strategies for secondary school mathematics education. For 15 years she has acted as tutor in the *Research Science Institute Summer Program* for gifted high school students, organised in collaboration with MIT, USA. She is author and co-author of more than 100 articles in Bulgarian and International scientific journals, 5 books and 20 textbooks; member of WG 3.5 of IFIP; co-editor of *Technology, Knowledge and Learning* and *Serdica Journal of Computing*. She has participated in the European projects Weblabs, I*Teach, DALEST, InnoMathEd, DynaMAT, Math2EARTH, Fibonacci, MeetMe, Mascil. She is the Bulgarian representative on the International Commission on Mathematical Instruction; awarded IFIP Outstanding Services Award (1991), Siemens Certificate for working with young talents.

Abstract of presentation: Stars and fractals with turtle geometry

The talk deals with the power of the language-based computer environments (Logo in our case) for carrying out mathematical experiments. How to generate stars (regular N-gons with intersecting sides) will be illustrated by means of the turtle geometry. As a next step more complex star configurations including fractals will be considered by means of relatively simple recursive Logo procedures. The main idea will be to demonstrate that the integration of notions from computer science (procedures, parameters, recursion), mathematics (mutual prime numbers, factorization) and art (graphics design) could be quite natural in the context of the project-oriented and inquiry-based learning.



The workshop will be conducted together with Toni Cehlarova.

Adelina Sporea

CV

Dr. Adelina Sporea graduated the Faculty of Chemistry at the *Politehnica* University in Bucharest, and has a PhD in material science research. She works at the National Institute for Laser, Plasma and Radiation Physics and has participated in several research projects within the framework of the EU's Fusion Programme, investigating irradiation effects on optoelectronic components and optical fibres. Presently she is deputy manager of Center for Science Education and Training - CSET and in charge of the day-to-day management of two FP7 educational projects that CSET coordinates in Romania, "Fibonacci" and "CreativeLittleScientist". Dr. Adelina Sporea developed an e-learning platform for primary and middle school teachers. She is also trainer for the accredited courses delivered by CSET for school science teachers. Now, she is project director for the national research project "Inquiry-Based Education in Science and Technology – i-BEST".

Abstract of presentation: Inquiry based science and technology education promoted by a national research project

This presentation describes the goals and the activities carried out in the frame of the Romanian research project "i-BSET". The major components of this project are: a collaborative platform where school children and teachers can develop dedicate projects, an e-learning platform accompanied by a virtual library with learning units, and several teaching kits, used to promote hands-on science teaching from early age (kindergarten) to high school. The collaborative platform is already used by more than 75 teachers from all over the country. The first subject they are working on is "Signs of Spring". The teaching aids will include also some original data loggers with the associated sensors, ready to be used in classroom.

Dan Sporea

CV

Dr. Dan Sporea, head of the Laser Metrology and Standardization Laboratory at the National Institute for Laser, Plasma and Radiation Physics, has coordinated over 15 national and international projects and participated in several research projects within the framework of the EU's Fusion Programme. He now leads the Romanian participation in two FP7 projects and the COST Actions TD1001 and IC1101. Dr. D. Sporea is Director of Center for Science Education and Training - CSET and Technical Deputy Director for the Center for Advanced Laser Technologies (CETAL), a project aimed at development of a high intensity PW-class laser facility for exploratory physics research of a PW-class laser facility. He coordinates in Romania two FP7 projects: "Fibonacci" and "Creative Little Scientists". He is trainer for the accredited courses for school teachers organized by CSET, and has co-chaired several international conferences and workshops on science education in schools. Dr Sporea has co-authored several book chapters on optoelectronics, optical sensing and irradiation effects in components and devices, one book chapter on science policy and two book chapters referring to science education policies.

Abstract of presentation: Creative Little Scientists – a European project

The conference contribution presents the EU FP7 funded project "Creative Little Scientists" which investigates the way science and mathematics education is linked to the development of creativity in early education. In the frame of the project, a desk research was conducted to gather information on the Romanian national official policy related to science and mathematics teaching for children 3 to 8 years old. Another work package was devoted to a national survey with the participation of over 250 pre-school and primary school teachers focused on the way these policies are applied in class. The last major activity of the project refers to a field research carried out in several pre-school and primary school units to provide an in depth view of the implementation of science and mathematics practice.

Lavinia Tofan

CV

Occupation or position held: Associate Professor PhD. Eng.

Educational experience:

Courses taught at undergraduate and master students.

- Analytical Chemistry

- Techniques for chemical analysis and quality control
- Analytical chemistry and instrumental analysis
- Environmental Chemistry and Physics
- Evaluation of quality indicators of environmental pollution
- Ecology and environmental protection.

Scientific activity:

- Books published by Publishing Houses recognised at national level: 16
- Chapters of books from foreign publishers: 3,
- Articles published in international journal (ISI ranked): 22,
- Articles published in journals indexed in the database: 37
- Scientific papers published in conference volumes: 10;
- Projects / research contracts: 26 (responsible for 3 contracts and collaborator to 12 national grants and 11 contracts
- 139 citation in international journals ISI ranked.
- Coefficient Hirsh-5

Abstract of presentation: Improvement of science education in primary and secondary schools by means of inquiry based learning and problem based learning.

The innovative educational methods - inquiry based learning and problem based learning- propose a paradigm shift from teaching to learning. Inquiry-based learning is a dynamic and emerging process that stimulates the natural curiosity of the students on the natural and material world where they live. The inquiry replaces in the center of education experience the questions and ideas of the teacher with those of the students. The problem based learning revolves around problems, representing real world situations designed to prepare students in understanding and solving them. After a brief description of the principles underlying the two methods, some representative cases of application of inquiry based learning and problem based learning in science teaching in primary and secondary classrooms are presented. Finally, a comparison between the effects of an inquiry based learning approach and of a problem based learning approach on academic achievement, attitude to science and research ability of some students from gymnasium were compared.

There is noticed that both educational approaches are efficiently in science learning. Both inquiry based learning and problem based learning have a significant favorable impact on the students attitude towards science.

Through a proper implementation of these educational strategies, the teachers can encourage students engaging in a new context of science learning.