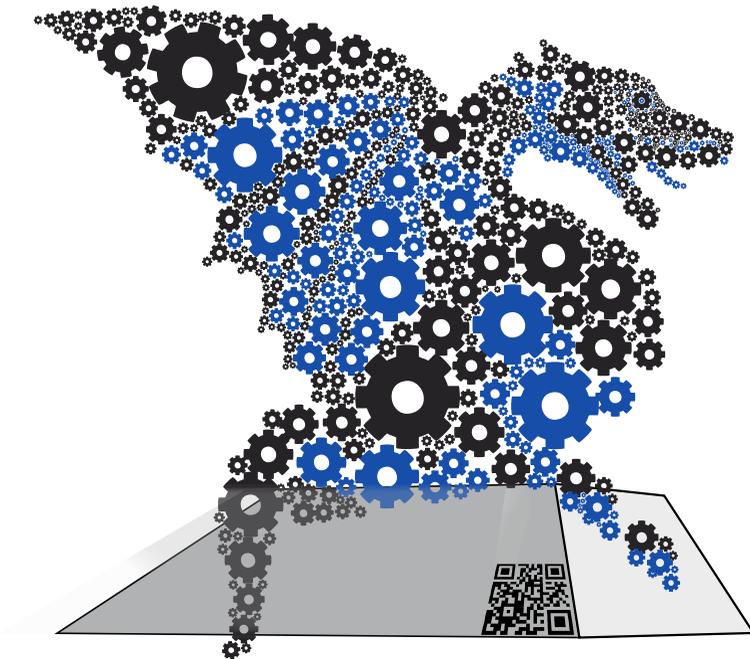


International Conference on Informatics in Schools

ISSEP 2015

September 28 - October 1, Ljubljana, Slovenia

Booklet of Abstracts



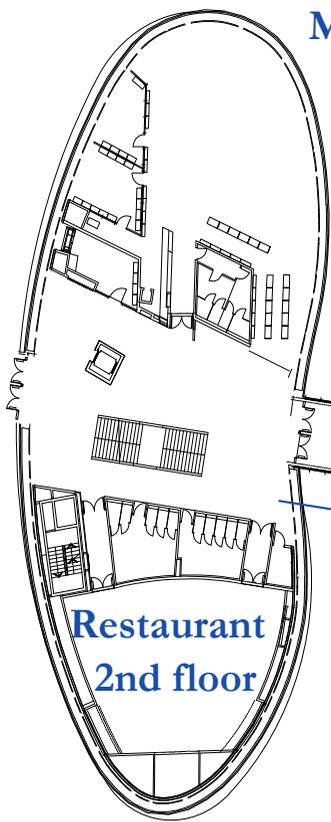
<http://issep15.fri.uni-lj.si>

Faculty building
1st floor

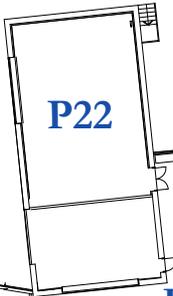
LPP bus station
»Živalski vrt ZOO«

Building X

Main entrance
Ground floor



Restaurant
2nd floor



P22



P18

P19

P20

Registration
desk

Coffee break

Posters

P01

PR09

LPP bus station
»Viško polje«

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University of Ljubljana
Faculty of Computer and Information Science

Doubtology (Tuesday)

Miha Kos, Hiša Eksperimentov – Hands-on science center in Slovenia

Our society is facing a pandemic illness without a name but with clear symptoms: apathy in place of passionate curiosity, looking for a quick and easy way to learn instead of striving for in-depth knowledge, being compliant and conformant instead of thinking critically. This talk will focus on curiosity and critical thinking, two of the most important driving forces behind the learning process. What are we doing wrong during education which often seems to be stifling curiosity instead of nurturing it? How do we excite the power of imagination and curiosity and light the spark that will cause students to learn by themselves? Feeling curious already?

Miha Kos has been the director of and motivating force behind the first Slovenian hands-on Science Centre called Hiša eksperimentov, since its very inception in 1996. In 1992, Mr Kos defended his PhD thesis on Nuclear magnetic resonance imaging in the Earth's magnetic field. In 1994, he conducted research work in Albuquerque, USA. After returning to Slovenia, he came up with the idea of establishing the first hands-on science centre in Slovenia. Besides leading and coordinating the work of the centre, he is active in the field of informal education, popularisation of science and learning, building new exhibits, writing scenarios for science shows on stage. He has also written scenarios to promote science TV shows.

Surprising Computer Science (Wednesday)

Tim Bell, University of Canterbury in Christchurch, New Zealand

Much of what we can do with Computer Science seems like magic, such as searching billions of items in a fraction of a second, or decrypting a secure message without needing to know the key that was used to encrypt it. Other parts are surprising - surely given a fast enough computer we can find the optimal solution to a problem? This talk will investigate magical and paradoxical ideas in computer science, and how it relates to Computer Science education.

Tim Bell is a professor at the University of Canterbury in Christchurch, New Zealand. His Computer Science Unplugged project is widely used internationally, and its books and videos have been translated into about 18 languages. Recently he has been actively involved in the design

and deployment of new computer science standards in New Zealand schools, and has run many teacher training events in New Zealand, Australia, and elsewhere.

The Theory Behind Theory – Computer Science Education Research Through the Lenses of Situated Learning (Thursday)

Maria Knobelsdorf, Computer Science Education, Universität Hamburg, Germany

Theories and concepts of how individuals learn play an important role in Computer Science Education (CS Ed) research because they not only affect which research questions we pose and what kind of data collection and analysis methods we choose, but more importantly influence the development of pedagogical concepts and interventions. This keynote introduces key characteristics of the situated learning approach and discusses from that perspective questions of pedagogy and educational research in Theory of Computation, and secondary CS Ed in the US (especially the New York City school district) and Germany. This discussion will exemplify how a change in learning theories alters the unit of analysis, thus reframing questions of educational research and pedagogy beyond knowledge acquisition.

Maria Knobelsdorf is a professor for Computer Science Education (CS Ed) at Universität Hamburg, Germany. She is originally based in Germany where CS is taught in high schools since the 1970s. Sharing the expertise of her community, Maria lived in NY and worked at the NYC Foundation for Computer Science Education and the Bronx Academy for Software Engineering where she consulted in CS Education curriculum development, teacher training, and evaluation of K-12 CS Ed programs. She is the founding co-chair of the international research conference in primary and secondary CS education (WiPSCE) and serves in several program committees as a reviewer. Her research in CS Ed is based on sociocultural cognition theories and qualitative empirical research designs, her recent research projects include learning theories in CS Ed research and cognitive apprenticeship in Theory of Computation. In former projects she investigated student engagement for programming visualizations and biography research of computer usage. Maria graduated in CS at Freie Universität Berlin, where she also received her PhD in CS Education.

This year, the 8th International Conference on Informatics in Schools: Situation, Evolution and Perspectives (ISSEP 2015) held at the University of Ljubljana, Slovenia, between September 28th and October 1st, 2015, was rather special. It was federated with a very successful Teacher Conference (VIVID) and therefore represented a wider forum to deliver fresh knowledge, ideas, and reports in direct classroom experiences.

ISSEP is on its own a forum for researchers and practitioners in the area of Informatics education, in both primary and secondary schools (K-12 education). The topics discussed at the conference are various and span from curriculum design and country reports to issues rather special on how to approach teaching programming and/or bring computational thinking to classroom. This colourfulness is also reflected in papers presented at this year's conference.

The ISSEP series started in 2005 in Klagenfurt (Celovec) and was followed by meetings in Vilnius (2006), Toruń (2008), Zürich (2010), Bratislava (2011), Oldenburg (2013), Istanbul (2014) and this year at the University of Ljubljana, Faculty of Computer and Information Science. We received 36 submissions for the conference and each submission was reviewed by up to four reviewers and evaluated on quality, originality, and relevance. Slightly less than half of the papers (17) were accepted for the presentation at the conference. Out of 17 accepted submissions, 14 were chosen to be published in a volume of Lecture Notes on Computer Science (LNCS 9378), *Informatics in Schools – Curricula, Competences, and Competitions*, published by Springer.

We want to thank once more to the Programme committee members for their diligent and great work that made this conference possible. We hope you will enjoy the conference and papers at least as much as we did.

September 25th, 2015

Andrej Brodnik, General Chair
Jan Vabrenhold, Program Chair

Bebras 1

A Snapshot of the First Implementation of Bebras International Informatics Contest in Turkey

Filiz Kalelioğlu, Başkent University, Department of Computer Education and Instructional Technologies, Ankara, Turkey

Yasemin Gülbahar, Ankara University, Department of Informatics, Ankara, Turkey

Orçun Madran, Hacettepe University, Department of Information Management, Ankara, Turkey

Computing was perceived as an essential skill for computer scientists, engineers, mathematicians and those from similar disciplines. Today, to the contrary, people of most ages are expected to possess basic computing skills in parallel with the requirements of up-to-date technological tools. To equip students with the necessary skills, computer science courses need to be delivered compulsorily, or at least delivered as a part of another course for almost all age groups and levels. Besides delivering these courses, awareness of this valuable skill is also essential, and for this aim, Olympiads or contests are now held in many countries. Bebras International Contest is one such organisation. In December 2014, Turkey also participated in this contest with 1,788 elementary students from different cities. This paper examines the student performance of the 2014 Bilge Kunduz (the Turkish term for Bebras) International Informatics Contest and explores coordinators' perceptions about the contest. Based on the student performance and overall success, the average score in Turkey was 65.01 (where scores varied between 0 and 135). According to the perceptions of coordinators, it can be said that the contest was favoured by all coordinators, but that some enhancements to the contest platform are needed.

Visual literacy in introductory informatics problems

Françoise Tort, STEF Research Laboratory, Ecole Normale Supérieure de Cachan, France

Béatrice Drot-Delange, Université Clermont Auvergne, Université Blaise Pascal, EA 4281, ACTé, France

The aim of our research work is to understand reasoning activities of students when they solve Bebras tasks, and especially how they use the diagrams in the solving process. We first need to classify them. This pa-

per gives first results of an ongoing work, of characterization of task according to (i) the types of diagrams and interactive artifacts given in statement and (ii) the way they are explicitly involved in solving process by textual statements of problems.

Bebras 2

Aspects of Quality in the Presentation of Informatics Challenge Tasks

Wolfgang Pohl, Hans-Werner Hein, BWINF/Bundesweite Informatikwettbewerbe Wachsbleiche 7, 53111 Bonn, Germany

So far, there has not been much scientific discussion about the quality of informatics tasks. The international community that is concerned with competitions like olympiads in informatics and the Bebras contest, however, has seen significant internal debate about even very detailed aspects of task quality. We describe the mechanics of developing Bebras tasks and formulate a central quality guideline for the development of task presentations. As an example, we demonstrate the critical steps in the development of one specific task and show that the modifications comply with the guideline. The guideline certainly refers to the circumstances of running a Bebras contest. Nevertheless, the guideline, and the recommendations we formulate on how to comply with it, are applicable to tasks in other settings – like exams or unsupervised learning scenarios – as well.

Tasks Classification and Age Differences in Task Perception. Case Study of International On-line Competition “Beaver”

Ekaterina Yagunova, Sergey Podznyakov, Saint-Petersburg State Electrotechnical Institution LETI after V.I.Ulianov (Lenin), St. Petersburg, Russia

Nina Ryzhova, State Corporation “Institution of Training – ARB Pro”, St Petersburg, Russia

Evgenia Razumovskaia, The University of Edinburgh, Old College, South Bridge, Edinburgh, United Kingdom

Nikolay Korovkin, St. Petersburg State Polytechnic University, St. Petersburg, Russia

Complexity is objective characteristic of a task. Difficulty defines the relationships between the task and the person solving it. We can evaluate task complexity a posteriori - by the portion of the participants who

solved task correctly. Task difficulty is hard to evaluate.

We offered and compared several approaches to evaluation of difficulty and complexity of tasks of the international informatics competition “Beaver”.

We found that a priori evaluation of problems by the organizers does not correspond to the difficulty of the task for the participants. The organizers underestimated the complexity for younger pupils and overestimated the difficulty for older. The pupils, especially primary school kids, frequently underestimate the complexity of the tasks.

We clustered the tasks by their difficulty and complexity into 4 clusters. One of them had tasks with significantly underestimated difficulty. We showed that one year age difference results in differing evaluations of task difficulty and complexity.

Country reports

Computing at School in Sweden – Experiences from Introducing Computer Science within Existing Subjects

Fredrik Heintz, Linda Mannila, Karin Nygård, Peter Parnes, Björn Regnell, Linköping U., Sjöstadsskolan Stockholm, Luleå U. of Tech., Lund U., Sweden

Computing is no longer considered a subject area only relevant for a narrow group of professionals, but rather as a vital part of general education that should be available to all children and youth. Since making changes to national curricula takes time, people are trying to find other ways of introducing children and youth to computing. In Sweden, several current initiatives by researchers and teachers aim at finding ways of working with computing within the current curriculum. In this paper we present case studies based on a selection of these initiatives from four major regions in Sweden and based on these case studies we present our ideas for how to move forward on introducing computational thinking on a larger scale in Swedish education.

Computer Science Competences in Italian Secondary Schools: a Preliminary Study

Silvio Giaffredo, Marco Ronchetti, DISI – University of Trento, Italy

Luisa Mich, DII – University of Trento, Italy

To enable a more effective process of learning and teaching, the peda-

gogic research and many educational institutions suggest an approach by competence. This approach is not yet widespread in the classes of Computer Science. This paper describes a study on Computer Science competences in Italian secondary schools. The study is the first step of an ongoing research project, whose goal is to develop an environment for the support of teaching by competences. To this end, a survey was run to gather data about the adoption of the competence approach in Italian secondary schools, among Computer Science teachers of 11 to 13 grade classes. The survey results are illustrated in the paper, along with the work-plan for developing the further steps of the research.

Introducing a New Computer Science Curriculum for All School Levels in Poland

Maciej M. Sysło, Anna Beata Kwiatkowska, Faculty of Mathematics and Computer Science, Nicolaus Copernicus University, Toruń, Faculty of Mathematics and Computer Science, University of Wrocław, Poland

The first regular informatics lessons in schools in Poland were organised in the second half of the 1960'. Some of them were devoted to programming a mainframe computer (in Wrocław) and some to theoretical models of computers and computations (in Warsaw). Then, for more than last 30 years of formal informatics education in Poland we have been very successful in keeping informatics (as computer science) as a stand-alone subject and in shaping its curriculum according to high standards of the discipline. In this paper, in Section 1 we first discuss terminology related to computers in education and then report on early history of informatics education in Poland. In Section 2, the present curriculum of informatics subjects is described in details together with some comments on using computational thinking in its implementation. Then, as the main contribution of this paper we introduce in Section 3 a new computer science curriculum for all school levels in Poland. To this end, the existing curricula of informatics subjects have been remodeled, extended (e.g. by adding programming to each level), and unified according to the five Unified aims of learning computing. The new curriculum benefits very much from our prior curricula and experience. Finally we discuss some implementation details, supporting activities, and the road map for a successful introduction of the curriculum to all schools.

Professional Development and Competitions

Online vs face-to-face engagement of Computing teachers for their professional development needs

Sue Sentance, King's College London, UK

Simon Humphreys, Computing At School, UK

After a period of intense activity in preparation for the transition, Computing has been implemented in the curriculum in England for all children from ages 5-16. In this paper we investigate the aspects of professional development that Computing teachers are utilising. We conducted a survey of over 900 Computing teachers in England and use the results to reflect on the benefits of face-to-face vs online communities to support teachers. Our results show that teachers find the face-to-face events and training to be useful, and that teachers in our community are participating in many hours of professional development in order to address their needs in content knowledge and pedagogical content knowledge in Computing. Furthermore an online community is valuable in supporting teachers who require resources, access to expertise and guidance on curriculum issues in addition to face-to-face training, networking and support.

Robotics Activities – Is the Investment Worthwhile?

Ronit Ben-Bassat Levy, Mordechai (Moti) Ben-Ari, Department of Science Teaching, Weizmann Institute of Science, Rehovot, Israel

Young people are deterred from studying *science, technology, engineering and mathematics (STEM)* by the perception that such studies are boring and by a lack of self-efficacy. One approach towards increasing engagement with STEM is through the use of robotics in education, both in formal instruction and through informal activities such as competitions. There is a consensus that such activities are “fun” but there is almost no research on whether there is any educational advantage to robotics activities. We are investigating the extent to which participation in robotics education activities influence the attitudes of students towards STEM and their intentions concerning STEM studies in the future. The research framework and methodology is the *theory of planned behavior (TPB)*, which claims that *attitudes* engender *intentions*, which in turn cause *behavior*. TPB is based upon questionnaires that are constructed base upon observations and interviews. The analysis of the answers from 106 questionnaires showed that the attitudes and the subjective norms

were not as high as we expected, but the results for the subjective norms are of particular importance, because they show that students can be motivated by the respect and support they receive from their teachers and parents. The scores for the intentions predictor were very high, which implies that the students are like to choose to study STEM in the future.

Olympiad in computer science and discrete mathematics

Athit Maytarttanakho, Vasiliy Akimushkin, Sergei Pozdniakov, Saint Petersburg Electrotechnical University “LETI”, Saint Petersburg, Russia

Many ideas of theoretical computer science is not yet included in the practice of school teaching. To test the methods of learning new ideas one can use the format of school Olympiads which form a circle of ideas and objectives which can be included in the future general curriculum.

The paper describes the experience of the Olympiad on theoretical computer science and discrete mathematics. The Olympiad consist of two rounds. The first round is held in a distant form but the second one is held on the premises of universities. All the rounds are organized in an electronic format and all the participants work with same manipulators which simulates important concepts or ideas of subject area. Thus, to the last round of Olympiad, all participants already will be acquainted with new ideas of subject area and during the time limit can solve more difficult problems.

As examples we discuss here tasks of DM&TI-2015. They are based on five manipulators: Turing machines, regular expressions, graphs, Tarski worlds (predicates and quantifiers) and logic circuits. The paper suggest a technics for problems design and using of manipulators for solving problems in computer science and discrete mathematics and technology for semiautomatic processing of results. The Olympiad uses web services that provide users feedback and interaction of authors and participants with problems during preparing and holding of the Olympiad.

Competence modeling

Defining proficiency levels of high school students in computer science by an empirical task analysis – Results of the MoKoM project

Jonas Neugebauer, Johannes Magenheim, Niclas Schaper, University of Paderborn, Germany

Laura Ohrndorf, Sigrid Schubert, University of Siegen, Germany

In the last few years an interdisciplinary team of researchers in the fields of organizational psychology and didactics of informatics have worked together to develop an empirical sound competence structure model, a measurement instrument and a competence level model. This is considered a relevant step for the reliable assessment of competences and the development of competence based curricula to foster the recent outcome orientation of the German educational system.

In this paper we publish the last component of our efforts: a model of proficiency levels, derived from the results of a competence assessment with over 500 German students. We describe different approaches to define proficiency levels and the process we used to derive them from our data. In the end, a detailed overview of the four proficiency levels is given and supplemented with exemplary tasks students should be able to solve on each.

Dimensions of Programming Knowledge

Andreas Mühling, Peter Hubwieser, Marc Berges, TUM School of Education, TU München, Germany

Nowadays, learning and teaching outcomes are defined predominantly by target competencies. In order to assess learning outcomes, properly defined and empirically validated competency models are required. For object-oriented programming, such models have not been brought forward up to now. Aiming to develop a competency structure and level model for this field, we have examined the structural knowledge of programming novices to derive its potential dimensions. The results suggest 6 dimensions. Additionally, we propose difficulty levels for two of these dimensions based on the SOLO taxonomy. The empirical validation of these dimensions and their levels is subject to further investigations.

Classrom Experiences

CS Unplugged: Experiences and Extensions

Irena Demšar, Alojzij Šuštar Primary School, St. Stanislav Institution, Ljubljana

Janez Demšar, University of Ljubljana, Slovenia

CS Unplugged is a set of activities for teaching CS concepts without using computers. We translated it to Slovenian and used it in different contexts, from the classroom and afterschool activity to summer school to professional development courses. In the paper, we summarize our adaptations, extensions and experiences.

Analyzing the Twitter Data Stream Using the Snap! Learning Environment

Andreas Grillenberger, Ralf Romeike, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Department of computer science, Computing Education Research Group, Erlangen, Germany

In the last few years, tremendous changes have occurred in the field *data management*, especially in the context of *big data*. Not only approaches for *data analysis* have changed, but also *real-time data analyses* gain in importance and support decision-making in various contexts. One of the most exciting approaches for processing and analyzing large amounts of data in nearly real-time are *data stream systems*.

In this paper, we will demonstrate how such developments in CS can be introduced in CS education by using data stream systems as an example. We will discuss these systems from a CS education point of view and describe an approach for carrying out data stream analysis by using the Twitter stream as data source. Also, we will show how the programming tool Snap! can be extended for supporting teaching in this context.

Programming

A language independent assessment of programming concepts knowledge

Franc Jakoš, Janka Glazerja Ruše Primary School, Ruše, Slovenia

Matija Lokar, Faculty of Mathematics and Physics, University of Ljubljana, Slovenia

At the end of any educational process there is usually an assessment of

the newly acquired knowledge. There are pedagogical goals and examples of tests, but they are all usually bound to a particular educational environment.

The article describes knowledge assessment created for grading the students' knowledge in the basic concepts of programming at the entry level of education. The tasks are simple, easily understood and do not assume any additional pre-existing knowledge. They are based on minimal teacher involvement and in most cases, students do not need further explanation. Such assessment requires the students to be familiar with the concept, as they have to transfer the knowledge pattern from the learning environment into the testing environment.

Programming in Scratch Using Inquiry-based Approach

Jiří Vaníček, University of South Bohemia in České Budějovice, Czech Republic

Inquiry-based learning has recently become one of the much advocated methodologies used especially in teaching of natural sciences. This of course opens the question whether it is suitable also for teaching informatics, or even more specifically for teaching programming in a didactical programming environment. In action research conducted within teaching practice of pre-service informatics teachers we tried to explore if any of the approaches and types of activities used by these pre-service teachers correspond to the principles of inquiry-based learning. In the research we study how pre-service teachers cope with these approaches to teaching, what contemporary pupils' attitudes to learning programming are, how this topic and the different activities used in the lessons appeal to them and how this type of lessons is perceived by teachers themselves – pre-service informatics teachers.

Is coding the way to go?

Violetta Lonati, Dario Malchiodi, Mattia Monga, Anna Morpurgo, Università degli Studi di Milano, Milan, Italy

Recently, several actions aimed at introducing informatics concepts to young students have been proposed. Among these, the “Hour of Code” initiative addresses a wide audience in several countries worldwide, with the goal of giving everyone the opportunity to learn computer science. This paper compares Hour of Code with an alternative, yet similar, approach which we believe is more effective in exposing pupils to the scientific value of the informatics discipline.

Classification of Programming Tasks, According to Required Skills and Knowledge Representation

Alexander Ruf, Marc Berges, and Peter Hubwieser, Technische Universität München, TUM School of Education, München, Germany

Tasks represent a central part of computer science lessons, and aim to practice programming skills or to concrete abstract concepts for example. We have investigated, which types of tasks are given to novice programmers, typically. For that purpose, we have analyzed and generalized tasks from textbooks and exercise sheets. The result is a list of twelve task types classified according to required skills and knowledge representation. In addition, we found that the task types differ very much regarding their incidence. Finally, we tried to relate the three found forms of knowledge representation to concepts of cognitive psychology.

Poster Session (Tuesday – Thursday)

Poster presentations are an integral part of this conference including a session with a fast-forward presentation of the poster's summary to all conference attendees. Twelve posters are presented, with various interesting topics. In addition, an extended abstract of each poster is published in the Local Proceedings. Topics covered are quite diverse ranging from describing the situation with computer science in different countries to various approaches in learning and teaching programming. Altogether, 24 authors coming from nine different countries are authors of these posters.

The overview of current state of computer science in Swiss high schools is reported by Jean-Philippe Pellet, Gabriel Parriaux, and Morgane Chevalier, contrasting the presentation by Okan Arslan and Selcan Kilis on Informatics Teacher Education in Turkey. The most represented topic is teaching computer programming, presented in various posters. Greg C Lee and Ling-Chian Chang talk about transition from visual programming language to C, Zsuzsanna Szalayne Tahy is approaching teaching programming indirectly with the use of “Paint” programme and Boštjan Resinovič uses a humanoid robot in teaching computer programming. Michele Moro and Luigino Calvi discuss concurrent programming basics through Snap! Gregor Jerše, Sonja Jerše, Matija Lokar and Matija Pretnar present their YASAAPE – a system for automatic assessment of programming exercises. Paul Libbrecht and Wolfgang Muller describe a vision of supporting the teachers towards the choice and adoption of ICT-based learning scenarios. The influence of teaching methods during technical e-safety instruction is analysed by Vaclav Šimandl, Vaclav Dobiaš, and Michal Šery. Martina Palazzolo and Paolo Mauri report how they used PirateBox to teach how to create simple web pages. Wolfgang Pohl and Jorg Westmeyer propose content categories for Informatics Tasks while Paul Libbrecht discusses alternatives for publishing open educational resources (OERs) and how they can be found using regular tools on the web.

September 16th, 2015

*Matija Lokar, Poster Session Chair
University of Ljubljana*

Posters (Tuesday – Thursday)

Computer Science for All in Swiss High Schools: Current State, Issues, and Perspectives

Jean-Philippe Pellet, Gabriel Parriaux, Morgane Chevalier
Lausanne University of Teacher Education, Teaching & Research Unit for Media & ICT, Lausanne, Switzerland

This poster discusses the main issues at stake in the task of determining a “computer science for all” curriculum in Swiss high schools. Such a task raises fundamental questions such as: what is CS exactly; what are its subtopics and its fundamental concepts; how should it be classified with respect to other sciences; who should teach it and with which required background; etc. In the poster, we graphically depict the discussion points and conclusions we have come to on such issues.

Learning to Program: from VPL to C

Greg C Lee, National Taiwan Normal University Taipei, Taiwan
Ling-Chian Chang, Hsin-Tien Senior High School New Taipei City, Taiwan

In recent years, visual programming language (VPL) has been very popular for introducing programming to K-12 students. Although students may enjoy the fun of visual programming, it is still a challenge to leap into programming in C/C++/Java. In this study, we aim to find ways to bridge the gap between VPL and C programming. Curriculums have been developed and pilot study is underway. Results on students' development of computational thinking skills as well as programming skills are to be reported at the conference.

The influence of teaching methods during technical e-safety instruction

Václav Šimandl, Faculty of Education, University of South Bohemia Budweis, Czech Republic

Václav Dobiáš, The Institute of Technology and Business Budweis, Czech Republic

Michal Šerý, Faculty of Education, University of South Bohemia Budweis, Czech Republic

The article looks at the influence of various teaching methods on the perception of technical e-safety issues as taught in the university curriculum. We have proposed four lesson scenarios for the teaching of

this topic. To measure the influence of the lessons, we have used pairs of semantic differential questionnaires, one pre-lesson and one post-lesson.

YASAAPE – Yet Another System for Automatic Assessment of Programming Exercises

Gregor Jerše, Sonja Jerše, Matija Lokar, Matija Pretnar, Faculty of Mathematics and Physics, University of Ljubljana, Slovenia

Programming is a skill where teachers are required to both encourage students by exposing them to numerous problems and supervise their attempts to solve them. To support this teaching

approach we developed a web service **Projekt Tomo**, presented in this poster.

The service is designed in such a way that it requires little or no additional work from students and teachers, enabling them to focus on the content. Furthermore, the service can be used in almost all teaching environments, as it can be adapted to most programming languages and has minor technical requirements.

Teaching Programming Indirectly with “Paint”

Zsuzsanna Szalayné Tahy, Eötvös Loránd University, Faculty of Informatics Budapest, Hungary

In many cases IT literacy is inadequate: users do not understand the concepts of software, and consequently using applications creates more problems. Professionals suggest learning programming to improve computational thinking [1]; but this way is impractical for many. There is another efficient method to teach computational thinking and prepare for programming. By using an application such as Paint software the teaching programming can be embedded into the teaching of application usage. So the way to the high level computational thinking and programming comes through exploring the used application.

From Paper to Web – Some Help from PirateBox

Martina Palazzolo, Istituto Comprensivo Ilaria Alpi Milan, Italy

Paolo Mauri, Istituto Comprensivo I. Calvino Lecco, Italy

We used PirateBox in a 7th grade class to teach how to create simple web pages. The first approach was to make pupils understand the concept of digitally formatted text using an unplugged activity developed by the Aladdin team. PirateBox allowed us to maintain a strong motiva-

tion in learning HTML.

The use of Nao, a humanoid robot, in teaching computer programming

Boštjan Resinovič, Šolski center Celje, Srednja šola za kemijo, elektrotehniko in računalništvo, Celje, Slovenia

Visual programming languages can reduce a novice programmer's problems in mastering the syntax of a language and developing computational thinking. But when the intrinsic switch to a traditional programming language is made, the same problems, along with new ones, arise. Students are faced with a different language, IDE, platform and often programming paradigm. To help overcome all of the above mentioned problems we propose using Nao, a humanoid robot, and its programming tools.

Content Categories for Informatics Tasks

Wolfgang Pohl, BWINF/Bundesweite Informatikwettbewerbe Bonn, Germany

Jörg Westmeyer, Rheinische Friedrich-Wilhelms-Universität Bonn, Germany

Organizers of task-based informatics competitions aim at composing task sets which cover diverse areas of the field. To achieve this goal, a system of categories is needed for classifying tasks according to the content area they cover. We identified and analyzed several category systems for informatics content. From that, we derived a new system that allows for task classification along both abstract and specific concepts of informatics.

Informatics Teacher Education in Turkey

Okan ARSLAN, Selcan KİLİS, Middle East Technical University Ankara, Turkey

The purpose of the study is to examine the informatics teacher education programme and ICT curriculum in Turkey. The study also compares national ICT teacher education programme in public universities with national ICT curriculum in public schools. This study applied systematic review as a quantitative method. Descriptives and frequencies were analysed in order to explore, define and interpret the data. There were 67 public universities in Turkey which have Computer Education and Instructional Technology (CEIT) department. Curriculums of all

universities were investigated. After excluding missing data, there were 34 universities. Results indicated that there were 4 main course categories: Domain Knowledge (38 percentage), Pedagogy (22 percentage), General (29 percentage), and Elective courses (11 percentage). The scope of Informatics teacher education programme was found much higher than ICT curriculum in schools that Informatics teachers teach in schools.

Concurrent programming basics through Snap!

Michele Moro, Dipartimento di Ingegneria dell'Informazione, University of Padova, Italy

Luigino Calvi, Istituto di Istruzione Superiore Negrelli-Forcellini, Feltre (BL), Italy

Snap! can be effectively used for introducing fundamentals of concurrent programming at secondary school level. Some basic synchronization tools have been implemented and tested.

Can I do that? Scenario Feasibility as an Enabler of ICT Usage

Wolfgang Müller, Media Education and Visualization (MEVIS)

Paul Libbrecht, Informatics Education Weingarten, University of Education, Germany

In this poster, we describe a vision of supporting the teachers towards the choice and adoption of ICT-based learning scenarios by means of mappings to the school infrastructure. The vision proposes the selection and curation of didactical design patterns, as repeatable solutions to problems found in such works as learning scenarios, and their mapping to each school's infrastructure. This collection of patterns, linked to experience reports and scenarios, will offer the regular teachers a way to plan for their applications with a trust of realizability.

Publication of Learning Resources: Central or Interoperable?

Paul Libbrecht, Weingarten University of Education, Germany

This poster discusses alternatives for publishing open educational resources (OERs) and how they can be found using regular tools on the web. This discussion attempts to propose solutions to the recurring problem of low endorsement of OERs.

The ISSEP Workshops

Workshops are distinguished meeting points for getting informed about the ongoing work in our relevant fields; current topics preferably in practical informatics at all school levels.

The ISSEP series started in 2005 in Klagenfurt/Austria. Five "tutorials" as a synonym for "workshops" have been offered then, covering rather soft Informatics topics as Security and Dependability in E-Learning, a presentation of Moodle, Didactic Aspects of e-Learning Contents Development, Fundamentals of Human-Computer Interaction and last, Insights into the functionality of a model search engine.

Ten years later, within the call for the 8th ISSEP conference following rather genuine Informatics topics have been proposed:

- Maker movement (e.g. robotics)
- CS unplugged activities and informatics contests/challenges
- Development environments and programming interfaces
- Web applications, web collaboration and production tools (e.g. moocs and e-books)
- Good practice and worked out examples
- Short and long term lesson plans, reference models and special curricular issues

Finally, the call yielded the three proposals "Teaching Software Engineering in Primary and Secondary Schools" from the Informatics Didactics team at Klagenfurt University in the neighbourhood Carinthia, "A web service for teaching programming" from an Slovene team and third, "Learning Computational Thinking through Bebras Tasks" as an Lithuanian/Austrian co-production.

September 23rd, 2015

*Peter Micheuz, Workshops' Chair
University of Klagenfurt*

A web service for teaching programming (Monday)

Gregor Jerše, Sonja Jerše, Matija Lokar, Matija Pretnar

Faculty of Mathematics and Physics, University of Ljubljana, Slovenia

Programming is a skill that can be best learned by writing as many programs as one can. So teachers are required to expose the students to numerous problems and of course supervise their attempts to solve them. To support this teaching approach, the authors developed a web service Projekt Tomo, which we aim to present at the workshop. This service has already been successfully used in various courses ranging from secondary schools to introductory courses in higher education.

The service works as follows: the student first downloads the files containing problems to his computer and starts filling in the solutions, checking them locally in his favourite coding environment, while the server automatically stores and verifies the solutions. In this way, there is no need for powerful servers and the service provides instantaneous feedback to the student and an overall insight into the obtained knowledge to both the student and the teacher, all without disturbing the teaching process. This helps teacher save time which he can spend for in-depth discussion about programming and giving additional help to those who need it.

An important aspect is also the fact that existing programming environment can be used by the student.

The teachers can also view a student's history of attempts and download the files with the attempted solutions if they want to analyse the student's progress and provide appropriate advice. These submissions can serve as a valuable insight into efforts made by the students towards the solutions. The service can be adapted to almost all teaching environments, as it can be used with all programming languages and has low technical requirements.

Agenda:

- Introduction to the web service - understanding the motivation behind the web service, logging into the service.
- Solving problems (as a student) - downloading a problem file, submitting a correct and an incorrect solution, understanding feedback.
- Analyzing submitted solutions (as a teacher) - getting an overview of correctness of submitted solutions, looking at individ-

- ual feedbacks, exploring the history of student submissions.
- Creating and editing problems (as a teacher) - modifying an existing problem, adding automated tests, creating a new problem.
- Discussion - getting feedback to steer future development.

Learning Computational Thinking through Bebras Tasks (Tuesday)

Valentina Dagiene, Vilnius University, Lithuania

Gerald Futschek, Vienna University of Technology, Austria

This workshop addresses all educationists and education scientists who are interested how school students can learn informatics (computer science) concepts and Computational Thinking through a contest.

The International Bebras Contest on Informatics is the world's largest contest on Computational Thinking. In the 2014 contest more than 900,000 students participated in 36 countries of all continents. The students have to solve 15 to 21 tasks within 40 to 60 minutes. To solve these tasks, students do not need specific pre-knowledge.

Tasks are developed for different age groups, from primary school to upper secondary school students.

The tasks contain concepts of about nearly all areas of informatics. Usually a short story introduces a task and states a problem, technical terms are not used, but to solve the task some kind of computational thinking must be applied. There are tasks about concept categories of information representation, algorithms, programming, logic, encryption and many other.

Items discussed in the workshop:

- Operational definition of computational thinking
- Why Bebras tasks can convey computational thinking?
- Which concepts of informatics can be introduced through Bebras tasks?
- How to teach computational thinking using Bebras tasks?
- Relations of Bebras contests to informatics curricula in various countries
- Formal and informal introducing informatics concepts

In the workshop the participants will learn more about the Bebras contest, how the tasks are created, which kind of tasks were produced, what are the effects on learning

and teaching. We will discuss how the Bebras contest should be performed in a school context and how the teachers may use the Bebras tasks in their teaching activities. The participants will experience wow-effects while solving Bebras tasks and how thinking is directed to solving strategies that are typical for informatics and computational thinking.

Teaching Software Engineering in Primary and Secondary Schools (Wednesday)

Peter Antonitsch, Andreas Bollin, Stefan Pasterk, Barbara Sabitzer

Institute for Informatics and Informatics Didactics, University of Klagenfurt, Austria

Software Engineering Research Group, University of Klagenfurt, Austria

Software is everywhere – be it in mobile phones, in washing machines, or in cars. With it, the importance of software Engineering (SE) is uncontested, and it is taught all over the world: at Universities, at Colleges, and recently also at High Schools. There are international Software Engineering curricula, standards, and certificates, but there is no manifestation of SE (and related practices) in the course syllabi at primary and secondary schools. Most important, SE is not just programming.

Taking a closer look at SE, its main goal is to develop programs that are affordable and dependable for consumers without bugs or glitches. In order to do so, SE education must account for a broad spectrum of knowledge and skills that software engineers will be required to apply throughout their professional life. Covering all the topics in depth within a school setting (from primary to secondary schools) seems to be infeasible due to the previous knowledge of the pupils, the curricular constraints as well as due to the inherent differences between the school types. Similar arguments hold for the teachers, as most of them are not really trained in SE. Now, based on the authors' experiences gained in combining SE topics with school projects in a vocational high school for commerce and tourism (11th grade) in cooperation with a lower secondary school (6th grade) it turned out that, by customization of the approach, one is able to address pupils with different maturity levels, educational aims, and backgrounds.

The objective of this 90-minutes workshop is to show that it is possible to interweave SE topics with school projects and to motivate for the

most important practices related to that field. Key skills and challenges are identified, mapped to the situation at hand, and, by following a step-wise approach, example settings are discussed.

Up to now, for Italian teachers of Informatics it has not been customary to organize regular meetings in order to address educational, curricular and pedagogical issues of their discipline. Also the most self-motivated among them had few occasions for discussion and for sharing their experience with colleagues facing similar problems elsewhere. Thus, the idea of having international teacher sessions within the IS-SEP conference is very welcome, in that it offers a valuable opportunity of professional enrichment.

The contributions from Italy (5), Hungary (1) and Austria (2) encompass all levels of school education and present interesting approaches to the teaching of computing topics.

Primary and lower-secondary teachers have taken a trans-disciplinary “computational thinking” perspective and view the learning within the field as a peculiar component of scientific education. More specifically, a main concern in Ferrari, Rabbone and Ruggiero's paper is interplay between unplugged activities and coding in order to design a sustainable curriculum for the elementary school. A balanced mix of unplugged tasks and work with computers is also central to the experiences described by Palazzolo, who in addition points out the need of engaging a larger number of middle-school teachers in similar projects. Moreover, Erdősné Németh addresses a classical topic in computing education: how to teach recursion to young pupils. Her proposal revisits the traditional approach of exploring graphical recursive structures in Logo.

High school teachers, on the other hand, seem to focus on “active learning” with some significant technological support. Boscaini and Valente discuss the educational implications of projects aimed at participating in robot contests, in particular as to the tradeoff between theoretical knowledge and practical skills learned by students. Brocato reports on her experience of teaching database fundamentals following a flipped-classroom approach with the aid of a learning management system. Finally, Danesino describes an introductory unit where the students are encouraged to analyze and explain network-related concepts by producing learning materials themselves. Her students use specific applications that allow them to apply augmented-reality techniques.

The two Austrian contributions provide a cursory and deep insight into all levels of Informatics education.

Peter Antonitsch takes a “A Cautious Look at Coding in Primary Edu-

cation” where he reports on an action research project in a primary school. He elaborates on two antagonistic viewpoints, one propagating that programming at this early stage fosters the intellectual development of pupils, and the other pointing at developmental risks when children are exposed too early to virtual environments.

In their contribution “Selected Spotlights on Informatics Education in Austrian Schools” Peter Micheuz and Barbara Sabitzer take a look at current developments going on in Austrian general Informatics education. They provide an overview with some insights about initiatives at primary education, insights into competence models and their impact on Informatics at secondary level, including curricula issues in the grade 9. Finally they present first results of a major reform of the final school leaving exam in Informatics (Matura).

September 23rd, 2015

Peter Micheuz
University of Klagenfurt

Barbara Demo
University of Torino

Claudio Mirolo
Università degli studi di Udine

Modern life can no longer be imagined without information and communication technologies (ICT). It is impossible to conceive that once upon a time communication mostly involved personal contact. Many believe that today's youth lost the ability of creating personal contacts and became asocial. However, the fact that ICT is enabling us to plan and organise not only our work but also our private lives, which tend to be increasingly limited in time, in a much easier manner, is obvious in every fact of everyday life.

In pedagogic terms, ICT increases both the level of motivation among learners as well as their creativity; it allows teachers to present complex knowledge and skills in a much clearer manner and illustrate intricate issues through play, practical examples and interactive learning. Even though geography lessons might be boring for many of us, ICT provides an array of possibilities for presenting the complexities of world geography through visual representations, which usually contribute to a much faster comprehension of the matter. Similarly, the use of ICT also proves advantageous when learning about other subjects and the world in general. Teachers have been dealing with the issue of motivation at school on a daily basis; at the same time, they are asking themselves how to arouse interest in learners and increase the potential for their development.

Flipped learning is one of the possibilities of achieving the aforementioned objectives. It enables learners to be active at different levels, while stimulating their critical thinking as they search for a solution to a given problem. This learning method allows learners to independently achieve key goals in their home environment and with the use of ICT. In turn, the school environment enables them to upgrade their knowledge with the help from their teachers. The use of ICT is thus changing the role of learners, who are no longer mere observers, but are becoming active participants not only in mastering the necessary knowledge, but also in developing critical and creative approaches to problem solving.

Apart from the use of ICT in the scope of contemporary teaching methods, one must also not ignore the fact that ICT increases the general sustainability or durability of knowledge. This is enabled by the different applications we use on our mobile devices, which provide continuous access to information and better time organisation. Google or Ap-

ple Maps applications represent one of the most efficient examples of the practical application of technology, of overcoming complexities when presenting individual topics to learners, of the vast amount of data and the user-friendly presentation of such data. These applications enable us to look into the most remote places on our planet, show us the way to reach them and provide us with important facts regarding their location.

This year's 18th VIVID 2015 Conference will present both the modern teaching methods as well as the use of modern ICT at the primary, secondary and tertiary level of education. It will also analyse the situation in Slovenia and inform us of developments elsewhere in Europe. The conference will see the participation of more than 60 presenters from Slovenia and abroad. They will all attempt to answer the following question: How can the use of ICT be brought closer to the learners and how can we raise the level of computer literacy without losing individuals' personality in the process?

September 24th, 2015

Mojca Bernik and Uroš Rajkovič
University of Maribor, Faculty of Organizational Sciences

VIVID organizers are:



The Use of ICT in Physics Lessons at Secondary School: Yes or No? How much? How?

Nataša Zabukovšek, First high school in Celje

Some concrete examples of the use of ICT in physics lessons are described in this article. The use of the equipment in the classroom (PCs, interactive board, projector, camera), the Vernier equipment for measuring at laboratory work, teacher's communication tools, programming equipment (MS PowerPoint, Kepler's law programme, Stellarium), web-sites (Youtube, school website, online classroom) and smart phones is listed. Our experiences and opinion on the concrete examples are described, too. The appropriate use of ICT increases the interest for the subject, improves the level of understanding and knowledge as well as the students' activity. In some phases of teaching, it can make teacher's job easier but different preparation and didactic approaches in classroom are required.

Impact of the use of information and communication technology in the teaching of chemistry in the context

Nataša Junež, Gimnazija Bežigrad

In the last time we can detect a decline in the understanding of science among adolescents and interest of young people to study science. Researchers believe that the main reason for this lies mainly in the traditional forms of teaching chemistry, which are based largely on the theoretical interpretation of scientific ideas and scientific theories (Bennet, 2006b). Teachers have expressed concern due to the lack of interest and inadequate attitude of students to science, thereby dealing a number of studies (Borgford, 1995; Cudd, 1999; Fraser 1999). One of the first projects, was examination of the views of students on the understanding of scientific ideas, was Salters Advanced Chemistry. In the desire of overcoming the situation as one of the possible solutions, was developed the approach of teaching chemistry in context (Context-based Chemistry), which has origins in the early eighties.

The most important research problem which I have raised is the evaluation of the impact of the approach to teaching chemistry in context, with the use of ICT technology, on the quality of knowledge of pupils in learning chemistry.

Creating a 3D printer as part of the project week

Aljaž Rogelj, School Centre Kranj

Technological developments and social changes directly affect on function and organization of educational activities. Technological progress and the development of ICT must be constantly involved in all forms and methods of learning. Since the 'classic' school learning can not meet all of the educational tasks some methods of project work are described in this paper. These methods offers more active attitude of pupils and teachers, and eliminate the traditional, authoritative attitude. This paper describes how the project work serves to explore the latest technologies which are not included in a traditional curricula and provide students a fundamental knowledge and skills prior to entry into the production environment. A project work may be due to the flexible structure a basis for cross-curricular integration.

Project based learning work in Information science, when students learn from each other

Andrej Šuštaršič, Gimnazija Bežigrad

In the first year of secondary education Information science is a mandatory subject. It is known that students have different prior knowledge and different skills because Information science is optional in primary school education. Students develop digital competence during the theoretical part of the subject and during practical work. Project based learning work and collaborative work present an important part of the practical work which aim and content is the knowledge to successfully and effectively solve informational problems. This article presents a case when students learn from each other during Information science classes and with the help of web classroom in these lessons. Project based learning work happens in different fields of presentations: written presentation of information, visual and audio presentation, presentation of information with the help of the moving picture – video and presentation based on a chart. These areas are the basis for the four organized group of students who interact with each other, exchange the gathered data, information, materials and knowledge.

Project based learning work is organized and lead in such a way that the theme is set at the beginning and each student chooses one group and suggests his/her title from the list of themes made beforehand. The students from the first group exchange knowledge from the field of arranging text whereas students from the second group exchange infor-

mation from the field of arranging photos and sound. The work in other two groups is done similarly. Exchanging knowledge among students is in that way also possible during the peer assessment activities.

Teaching computer programming to students of a different perceptual types

Gašper Strniša, School centre Kranj

People receive, transfer and process the information in different ways. Depending on the development of certain brain centers we are divided into visual, aural and kinesthetic sensory and learning types. Results of the survey on Specialist grammar school in School Centre Kranj are showing representation of all types of learning and a strong correlation with particular types and the perception of the found sensory type. In trying to ensure equality and equal opportunities in the educational process it is necessary to ensure delivering educational materials in several different ways. The paper shows the interpretation of the loop While in the programming language Java.

Using visual programming languages and robots to teach programming

Boštjan Resinovič, School Centre Celje, Secondary School of Chemistry, Electrical Engineering and Computer Engineering

The following paper first focuses on the initial stages of learning computer programming when it's the most important to master the basic programming techniques and develop computational thinking. Then it deals with the next phase when it is necessary to become proficient in a chosen programming language widely used every day in production. It points out some of the characteristics of learning the basics of computer programming and identifies typical problems novice programmers run into. Then it shows the ways to ease some of these problems using visual programming languages and discusses which of those languages provide for an easy transition to traditional textual production languages. It suggests that the use of robots and their corresponding programming tools can be very effective.

Electronic Temperature Measurement of the Water Boiling Point **Lea Červan, I. Primary school Celje**

The elementary school ninth grade students are familiar with the change of aggregation states. However, when asked, which temperature

I can heat the water to, only few individuals know the right answer every year. By means of the experiment I make with an electronic temperature meter and drawing a temperature graph on the computer, the students say that they get the answer which they keep in mind.

The role of the teacher in ICT-supported foreign language instruction in Slovenian secondary schools

Saša Podgoršek, Faculty of Arts, University of Ljubljana

Brigita Kacjan, Faculty of Arts, University of Maribor

The role of the teacher depends on the institutional framework within which they work, as well as on their knowledge, beliefs and attitudes. In addition, in the last decade technology and its use in the classroom has had a great impact on the role of the teacher. The study was to determine whether foreign language teachers in Slovenian secondary schools believe that their role in ICT-supported foreign language instruction changed and how language teachers perceive their role. In order to answer the research questions, we conducted a qualitative analysis as a part of a broader quantitative non-experimental study. The quantitative analysis showed that a majority of the teachers felt that their role of the teacher has changed. However, the qualitative analysis revealed that changes are not major, and do not indicate a shift in the teaching paradigm that would significantly differ from the traditional way of teaching, even though supported with ICT. A major shift is in the focus on active learning of the student and the mentoring role of the teacher.

Business and Professional English at the Vocational College – A step from applicability to application

Helena Jošt, Vocational College, School Centre Kranj

The paper presents reasoning and already carried out cases of the use of English for business and professional uses at the vocational college level. The chosen orientation of the work is the result of the awareness that because of the needs of the business environment and also, and in particularly, because of the criticality of the situation on the labour market it is no longer sufficient to think merely about the applicability of acquired English but it is increasingly necessary, wherever possible, to make a step forward to the actual application of the acquired language knowledge and skills. For this purpose the internet offers to lecturers and students a number of specialized online networks and portals, but on the other hand it is also possible to use the more traditional

and thus more personalized opportunities of cooperation with companies and demonstration of knowledge on specific students' obligations in the classroom, etc. In the future opportunities and needs will almost certainly increase further on, so they will, therefore, call for an even more constantly attentive and active lecturer.

Flipped Learning in Business Mathematics with the Support of ICT

Karmen Grudnik, Janja Razgoršek, School Centre Slovenj Gradec, Higher Vocational College

The paper analyzes “flipped learning” as a method for carrying out the educational process in the subject Business Mathematics with the support of information and communications technology (ICT). The analysis is based on a study that surveyed students in their first year at the Higher Vocational College in Slovenj Gradec in the academic year 2014/15. Flipped learning/flipped classroom combines classroom learning and distance learning. Before the lesson, the teacher or lecturer uploads a properly prepared lecture in the form of a video on the internet, and the student views it before the next lecture with the teacher/lecturer where the knowledge is revised. To determine the suitability of flipped learning for the educational work with the students of the Higher Vocational College in Slovenj Gradec in the subject Business Mathematics, the chosen topic was adjusted for implementation in flipped learning. This was based on an interdisciplinary collaboration of Business Mathematics and Business Informatics, since flipped learning requires the use of modern ICT. The topic was then covered using flipped learning.

A survey of the students after carrying out flipped learning showed that the students recognize a significant advantage of flipped learning: it provides an option to adjust the pace of studying or work to their individual needs. Students recommend the introduction of flipped learning to support the traditional way of studying. The SWOT analysis of flipped learning points to new opportunities for improving the educational process. Importantly, this method offers a solution for the problem of students acquiring knowledge of business mathematics at a different pace due to a different existing knowledge of mathematics. However, to introduce these improvements efficiently, flipped learning should be implemented in conjunction with an interdisciplinary collaboration of ICT lecturers and Business Mathematics lecturers.

CODE Q: A programming tutor

Timotej Lazar, Ivan Bratko, Aleksander Sadikov, University of Ljubljana, Faculty of Computer and Information Science

We describe the prototype of the CODE Q programming tutor and our experience using it for teaching Prolog to undergraduates. We highlight the most interesting aspects of the system: testing student submissions and automatic generation of counterexamples, predefined and automatically-generated hints to the user, and the effect of gamification on learning and the user experience. The system was used by over 100 students for the duration of one semester. The paper includes selected comments gathered with an end-of-semester questionnaire.

Game mechanics in educational processes

Tilen Markun, Marko Urh, Rok Pintar, Davorin Kofjač, University of Maribor, Faculty of Organizational Sciences

This article addresses the elements of game mechanics and their use in the field of education. We explain the advantages and uses of game mechanics and gamification in education and former research on this field. Below we explain the difference between game mechanics and game dynamics and the impact on gamification. The main attributes of game mechanics and its positive effects are shown in increased motivation, efficiency, performance and engagement of an individual within an educational process. Game mechanics elements contribute to increased use of individual materials regular monitoring of changes and guiding information encourage teamwork and increase attendance and activity of an individual in a system. The article shows guidelines for needs analysis and introduction with monitoring elements of game mechanics in educational process.

Use of game mechanics in faculty environment

Miha Debeljak, Davorin Kofjač, Rok Pintar, Marko Urh, University of Maribor, Faculty of Organizational Sciences

This article presents research on the use of game mechanics in faculty environment. Our survey was conducted at the Faculty of Organizational Sciences, University of Maribor, and was directed towards students of the same faculty. The article describes basic concepts of game mechanics and gamification and their use in practise. Featured are important preliminary research on the field of gamification and its application in education. Game mechanics are being increasingly used in var-

ious fields, mainly due to the positive effects and benefits they bring. Current research suggests that game mechanics have a lot of positive effects in the field of education. This article presents how frequent game mechanics are being used, their impact on student motivation and the importance of individual elements of game mechanics within the faculty environment. Also shown are findings and recommendations for the use of game mechanics in practise and recommendations for further work and research.

E-learning - an opportunity for developing individual Sašo Bizant, School centre Kranj

Major changes in the development of IKT technologies point to changes in our society and are becoming a challenge for alternative acquisition of knowledge and information. The purpose of this paper is to show successful entrepreneurial workshops that were prepare for students of technical programs at VŠŠ ŠC Kranj in cooperation with smart:up RC IKT Technology Park Kranj.

With these new methods we will adapt more easily to the needs of the students and provide them with the opportunity to gain information that will serve as the grounds for their own innovative solutions.

The first steps in the world of astronomy using the program Celestia and Google Earth in the early grades of elementary school

Tina Pajnik, Primary school Vide Pregarc

When the science curriculum in primary school was updated, some science content like exploring Earth became optional. Children from an early age are interested in exploring, how space affects life on Earth. In the early grades of elementary school science content are very concrete and full illustrated. Astronomical concepts are very abstract for children. In elementary school Vide Pregarc in Ljubljana we carried out workshops for children to learn about the universe. We used the program Celestia and Google Earth, which helped us as a starting point for the study of the universe. The children get to know the planets, galaxies and causes of the seasons and other time concepts.

Use of multimedia in teaching fractions Anja Janežič, Primary school Martin Krpan

This paper presents a multimedia concept, understanding of the concept, theoretical findings on the impact of multimedia tools for teaching and the difficulties faced by the students while learning a complex

mathematical content of the concept of fractions. Paper represents different mathematical teaching games that contain all aspects of the concept of fractions. All mathematical teaching games can be accessed free of charge via the Internet. In the final part of the article the results of a survey on whether the use of multi-media devices can contribute to a better understanding of the mathematical content are presented.

Sets, Revision of Number Sets and Relationships Between Them Through a Video

Mateja Štefančič, Sostro primary school

Pupils in the 4th, 5th and 6th grades learn about the concept of a set and in the 8th grade their knowledge is extended to number sets. Because learning about sets can be dull especially with teacher-centred approach, students can revise this subject in another way, for example with the help of a video.

In this article the contents of the video and its usage are explained. The lesson is composed of treating the concept of a set and then revising it, where the video is included. The first part of the video shows pupils who represent numbers and their placement into a specified number set (the classroom represents a set). In the second part of the video pupils represent number sets and are placed in formations (Venn diagram). While watching the video pupils are filling in a handout, consolidating knowledge: they are finding out which set is presented, which are its components, in what kind of relationships are individual sets etc.

Using a Tablet PC in Math Class

Mojca Pev, Primary school Drago Bajc Vipava

In this article, I am presenting the possibility of using the tablet PC in Math class. In our work, we focused on free applications designed for math and data processing. I will describe some other free applications which pupils have found sensible for usage in the classroom.

Mobile application encouraging physical activity of schoolchildren for more effective physical education

Mitja Luštrek, Božidara Cvetković, Vito Janko, Institut »Jožef Stefan«, Department of Intelligent Systems

Boro Štrumbelj, Jožef Štihec, Tanja Kajtna, University of Ljubljana, Faculty of Sport

School physical education aims to teach essential movement patterns

and sports, and to encourage children to be physically active in their leisure time throughout their lives. Unfortunately the physical fitness of Slovenian youth has decreased substantially in the last 20 years. Because of that, the e-Gibalec project developed a mobile application that – in cooperation with physical-education teachers and parents – encourages schoolchildren to be more active and adopt a healthier lifestyle. The application will use smartphone sensors and intelligent computer methods to monitor the children's movement in their leisure time. These data will be available to physical-education teachers, enabling a personalised approach in the class and guidance regarding the pupils' leisure time. In addition, the application itself will encourage physical activity: feedback about physical activity and friendly avatars will instill internal motivation, while competition with friends will complement this as external motivation. We expect such a combination to successfully boost the users' physical activity. If we manage to introduce the application to all interested primary schools, an impact on the Slovenian youth in general can be expected.

Ball Juggling and Information Technology

Robert Grom, Primary school Rovte

Ko učenci pomislijo na delo oziroma na učenje, jim vedno postane nelagodno. Iz izkušenj vedo, da bosta za doseg znanja potrebna potrpljenje in motivacija.

Pedagogi se velikokrat sprašujemo, kako dvigniti raven motivacije pri pouku? Kako pritegniti pozornost učencev in z manj energije doseči več?

Pouk lahko popestrimo z različnimi novostmi. Ena od novosti je žongliranje. To je športna dejavnost, kjer se lahko učenci sprostijo in pridobijo samozavest. Pomaga pri koordinaciji gibov in ravnotežju, izboljšuje koncentracijo in znižuje stopnjo agresivnosti. Daje učencem pozitivno energijo, ki jo je moč prepoznati, ko učencem nekaj uspe. Svet tehnologije nas je v zadnjem času očaral, saj ponuja številne možnosti za hitro napredovanje in uspešno učenje.

Učenci uporabljajo pametne telefone prav tako pogosto kot žogice, kadar to je in kadar to ni dovoljeno. Je morda možno tudi te vrste aktivnost preusmeriti k uram pouka?

Pogoj je priznavanje, da je e-kompetentnost učiteljev in digitalna pismenost širše družbe abeceda sodobnega izobraževanja.

A multimedia presentation of gymnastic elements

Domen Ambrož, I. Primary school Celje

Visualization is of great importance in sport. Students in primary school learn new basic elements in different sports, so it is of great importance that they can see a good demonstration. In addition to the actual demonstration, the teacher can offer picture and video material. Usually, this material is used to display the harder elements of the sport, but it can also add variety in learning easier elements in individual sports.

With video material, which is freely accessible online, the students learn about the new learning content in the subject of sport. In addition to basic gymnastic elements, which have been shown to them, students also learnt how to search sports topics online.

This paper will present the introductory lesson of gymnastics with video material as a tool for easier presentation of an upcoming educational material

Using ICT for study purposes and its impact on information literacy of organizational sciences students

Alenka Baggia, Mirjana Kljajić Borštnar, Andreja Pucihar, University of Maribor, Faculty of Organizational Sciences

As well as our way of life, students' habits, content and method of study in higher education are changing. In order to determine, how this changes reflect in study habits, a questionnaire for academic higher education and master degree students in three different study programmes was developed. Students were asked about the method and frequency of information and communications technology (ICT) usage for study purposes. The results were compared to the information literacy (IL) and self-confidence of students when using the World Wide Web. It was established, that the level of IL knowledge after the involvement in courses with IL was not significantly improved as it was expected. The detailed analysis of the sample shows that students were frequent users of ICT and applications, which could be one of the reasons for the low improvement of students' IL knowledge. Problem based learning is proposed as one of the possibilities for improvement.

Crime and punishment: Participation in auditoria and videoconference lectures and problem solving performance

Robert Leskovar, Alenka Baggia, University of Maribor, Faculty of Organizational Sciences

The correlation between the participation in auditoria and videoconference lectures and the problem solving performance in Computer Sciences and Informatics course at the university study at Faculty of Organizational Sciences is discussed in the paper. The open source BigBlueButton (BBB) videoconference system integrated in the Moodle learning environment was used in the presented case. The results show that attendance on auditoria as well as videoconference lectures is correlated with higher performance in problem solving. The correlation in both learning forms is positive. The correlation between videoconference lectures and problem solving performance is higher than the correlation between auditoria lectures and problem solving performance. Groups of students with different frequency of participation are have significantly different number of successfully solved tasks. The discussed course is specific in a way that different software packages have to be used for solving tasks. The interaction between the participants of the study process, enable by the videoconferencing system is in the presented case equal to the interaction in auditoria lectures.

Establishing the most significant moral values of the Vocational College of Kranj School Centre using the LimeSurvey web-based survey tool

Nastja Beznik, School Centre Kranj, Vocational College

Computer-assisted data collection through various forms of web-based surveys allows researchers to obtain higher-quality data at lower costs. The first part of this paper defines the most significant characteristics of web-based surveys, while the second part provides an overview of the functionalities of the LimeSurvey software tool used in the study. The empirical part of the paper refers to the survey conducted by the Vocational College of Kranj School Centre whose primary goal was to determine whether the values documented in the quality management system are consistent with the values of the students, who are the users of our services. The secondary goal of the study was to present to students one of the numerous applications used for web-based surveys, which they can use when obtaining data for seminar papers and theses. The paper describes the methods of conducting web-based surveys and defines the main findings of the research on ethics and values in the organisation.

ExplorEdu: Artificial Intelligence based technology to support Open Educational Resources (OER)

Davor Orlič, Mitja Jermol, Institut Jožef Stefan

ExplorEdu – system of freely available web services and mobile applications for automatic identification, capture, enrichment, editing, in-depth analysis and intelligent re-use of open educational resources (OER) existing web and mobile services, studies and results of research projects, researchers, curriculum, rules and legislation in Slovenia and the world.

C-EXHIBITION: Advanced Cloud Service for Exhibitions Using Mobile Sensors and RFID/NFC Technologies

Vlado Stankovski, Faculty of Civil and Geodetic Engineering, University of Ljubljana

Preparation and setting up of exhibitions is an important learning method in various levels of education. Exhibitions are usually designed in a classic way. Exhibit is equipped with a short text which the visitor can read. Text contains information about the author and work. C-EXHIBITION (O-RAZSTAVA) is an advanced cloud service, which is based on the use of mobile sensors and RFID/NFC technologies. Technological solution enables new experiences for the exhibitor, the evaluator as well as visitor. The authors of the exhibits can prepare multimedia contents (descriptions and explanations of work) and publish them online. Evaluators (e.g. teachers) can publish or submit their written or oral reviews of the work. Visitors can easily access the content with mobile phones, add their own content, comments and participate as a special category in the analysis of exhibits. In this way, C-EXHIBITION allows the creation of efficient, open, educational content and practice in setting up exhibitions. These have the potential to increase the efficiency of education through more personalized learning and better learning experience. Participants have options to participate in new ways (creation of the content of the exhibit, comments), which upgrades the existing educational methods.

Evaluation of bachelor degree during development

Zvone Balantič, University of Maribor, Faculty of Organizational Sciences

Branka Balantič, School Centre Kranj, Vocational College

Bachelor degree completed at the end of study represents and compiles professional work of individual student. The main emphasis of bachelor degree is on own research work of student. With this student shows competence and ability of compiling and comparative multidirectional and multilayer thinking about the studied topic.

Bachelor degree should be appropriately structured and constructed according to good analysis practice and competent synthesis. Assembling of expert knowledge and combining it into meaningful whole starts with selection of topic and mentor. The key question for student is how and where to start for which very important is the idea.

Elements of good bachelor degree are detailed description and accurate analysis of the problem and methods which lead to a clear study plan. Student is usually challenged with intensive coordination process of degree creation where also selected mentor cooperates.

To achieve expect good results which will be understandable to professional public, common normative for bachelor writing should be followed. Protocols which slightly differ usually in their basis follow many times confirmed protocol of IMRAD system (Introduction, Methods, Results and Discussion). The mentor should frequently evaluate the bachelor degree in formation and make responsible steering of student.

Generating Random Questions Using MySQL and Importing into the Moodle Quiz

Uroš Sterle, Secondary school for electrotechnics and informatics, School centre Kranj

Each professor would like to have a system that would allow the generation of random questions for the test and at the end you would get the grade. With my skills of MySQL programming I did it. System generates questions in GIFT format which can be imported into Moodle quiz. After solving the quiz, we are able to view the results, which was the main objective of the research.

Flipped learning in primary classroom – how to start?

Erika Grosar, Primary school Solkan

Integrating different modern technologies in education is a challenge

for a teacher as they can additionally motivate technologically more demanding younger generation. Flipped learning introduced positive enrichment among already known methods. Flipped learning is a way of learning with the help of teacher's video explanation of the subject matter. Students watch the video lesson at home while, in the classroom, they solve tasks together with a teacher.

This article provides information and experience on how to start with the planning of such a way of teaching and which ICT tools were used for the creation of the video.

Flipped learning in 3th classroom

Barbara Gabrijelčič, Primary school Solkan

The main focus of the flipped learning is not learning through video, but the maximum utilization of time spent together with students in the classroom. It helps teachers to gain insight into how to teach. It helps to think about what to communicate to the learner. It helps to focus on the pupil, how to understand the message the teacher delivers in the video. With this method of teaching we achieve that the pupil is active at various levels and acquires lifelong knowledge. Due to the dynamic and relaxed lessons this kind of teaching is very popular with the students.

A small flipped classroom

Mojca Pozvek, Primary school Koseze

A small flipped classroom is an e-classroom which is thematically and graphically designed for students attending classes from 3 to 5. The goal of the flipped classroom is to guide the student to individually learn about new topics in a familiar computer environment, to master these topics, and to take responsibility for his own work. Didactic material which is compiled by the teacher needs to activate as many perceptual styles as possible. Each task has to be preceded by a set of instructions which must be clear and comprehensible also to students with reading and writing deficiencies. The instructions should guide the students to work in concordance with didactic recommendations. Work in the flipped classroom is intended to be done at weekends when students are not additionally occupied with extracurricular activities. The success of such a learning process is evaluated at school in form of feedback through discussion and by solving problems and answering questions.

OSU teaching tool - Observe, Infer, Act

**Matevž Vučnik, Miha Smolnikar, Polona Šega, Mihael Mohorčič,
Institut "Jožef Stefan"**

Alenka Mozer, Gimnazija Vič

Polonca Krašovec, Sonja Blažun, Petra Cifer, Primary school Mislinja

The OSU teaching tool – Observe, Infer, Act – is intended for integrating diverse sources of information in the educational process in different subjects at different levels of educational system. It supports interactive work with a variety of information sources, both at the level of data as well such as management of devices. It is implemented as a server platform in the cloud, based on the platform Videk, used for capturing, managing and fusion of data sources in support to the OSU web service. Web service and mobile applications are, through HTML5 technology, extended with the functionality to capture data from various data sources and perform operations with the selected data sources. Testing, validation and integration of the tool into the educational process is carried out on the secondary and elementary school levels on the air quality monitoring use case and on the beehive monitoring use case.

Learn Vocabulary in a Fun Way! – ICT Supported Vocabulary Learning

Vlasta Rudar-Nenadović, School centre Ljubljana, Gimnazija Antona Aškerc

We are living in these amazing times when all learners, regardless of our age, can connect in so many different ways – when we want to learn something, we go to YouTube, we go to Twitter to debate and we blog about various topics etc., so all learners are at the same time creators. The same goes for teachers, who are now becoming ‘tour guides’ of learning possibilities. Also, learning spaces are no longer only physical classrooms but virtual spaces, digital classrooms as well. There are many technology tools at our disposal that can be used to enhance the effectiveness of the teacher. We need, however, to broaden the ‘menu’ of the media and tools we use in class almost on daily basis. The following contribution, showing some examples of using the media and tools, may help to illustrate our transitional era. This paper focuses mainly on vocabulary learning through various kinds of ICT supported games available on websites, as apps or teacher-devised.

Cognitive theory of multimedia learning with interactive workshops "Energy past and present"

**Lea Janežič, Secondary vocational and technical school Bežigrad
Miha Povšič, Srednja šola Jesenice**

Learning using a computer today is a commonplace, because the web provides a large database of interactive and multimedia content which are more attractive than fixed images in textbooks. The Internet and web application provides many activities for pupils in virtual laboratories, participation in videoconferences, chat with friends, teachers and scientists, and active use of forums for exchanging experiences. When integrating multimedia with interactive workshops on energy, the survey, conducted in 106 children in 6th and 9th grade showed a statistically significant difference in the delayed examination. Experimental group of students listening the lecture on energy including several multimedia elements, which followed the principles of cognitive theories of learning with multimedia, achieved higher scores.

The role of e-materials in conceptual learning of physics

**Simon Ülen, Alma Mater Europaea – ECM, Gimnazija Franca
Miklošiča Ljutomer**

During the last decade the Slovene researchers in the field of (secondary) education have developed lot of e-materials, specially designed for the teaching of physics. In the paper we present the key characteristics of e-materials and the case of the usage of e-materials with associate to the main goals of the conceptual learning of physics. In the first place, interactive-based learning material can help students to achieve a deeper understanding of basic physics` concepts, what is the main goal of the conceptual learning of physics.

Preparing programming exercises with efficient automated validation tests

**Gregor Jerše, Sonja Jerše, Matija Lokar, Matija Pretnar, Faculty of
Mathematics and Physics, University of Ljubljana**

This paper presents Projekt Tomo web service, a service intended for automatic assessment of programming tasks in various programming languages and gives instructions for teachers on how to prepare problems with efficient automated validation tests.

Health Day in the third class supported by ICT

Anita Smole, Sonja Strgar, Primary school Vide Pregarc

The paper presents an example of science activities, which was carried out in the third grade of elementary school. Five school hours activities were held on the topic of health. Students participated in the online training with Juvi, they made leaflets on health, conducted Silent phone with QR-codes, participated in the quiz from a to z, made fruit and vegetable smoothie and finally they solved the evaluation questionnaire. Presented activities demonstrate that teacher can use the advantages of ICT to achieve the learning objectives within the course of subject. At the same time students can achieve other lifelong goals.

Morning workout with QR codes in ICT camp

Anita Smole, Sonja Strgar, Primary school Vide Pregarc

The paper presents activities which were made in the ICT camp - morning workout with QR codes. Teachers have prepared a complex of gymnastic exercise. Individual exercise has been saved as image and converted to QR code. At the beginning pupils uploaded application for reading QR code. At each station, students photographed QR code. Then the phone converted the code in the image, which was suitable for reading. All the time students were highly motivated. In the end it turned out that they were very active. The same was confirmed by the final evaluation of children. The above example is just one way of how to make everyday activities more interesting for students.

How independent are 5th grade pupils?

Andreja Žavbi Kren, Primary school Toma Brejca

The article describes how 5th grade pupils developed their (transversal) skills through project work. The work was done individually and without much help on the teacher's part. Each pupil worked with their own computer. Pupils needed to be quite creative and innovative in order to finish the assignment. Thus pupils developed not only their innovativeness, but all eight basic competencies, especially their digital competence. In the end, pupils' knowledge was assessed. It was found out that compared to the previous year's generation of students, the knowledge was not much better. However, what was essential was the way pupils acquired their knowledge which, in turn, will definitely be long-lasting.

ECO BARBIES and e-education (with ephasis on learning about non-material distant cultural heritage)

Nataša Grom, Primary School Domžale

In the process of learning and realization of activities in primary school, there is no space for unplanned absence of organizer/teacher. That kind of example was an obstacle at first and later it cleared up as an opportunity for a progress in education and upgrade of study process with modern learning methods and approach on distance.

Children learn from behavioural patterns of adult people and imitate us. The need for multifaceted giving of information and knowledge is becoming more and more important. Why would the field of keeping non-material cultural heritage not be presented to them by ICT and unknowingly give them a model, that they need?

Eco Barbies were arised from e-study material in advance with support of pedagogic e-competence.

Alternative approach to music theory learning in alternative music school

Boris Volarič, Cultural art society KUD Coda

At Kulturno umetniško društvo Coda we have, based on 10 years of experience in alternative teaching of music, decided to prepare alternative method of teaching musical theory, that is massive open on-line course. In on-line learning environment Moodle, we prepared materials and activates for seven weekly sets. In this article, we describe the development, preparations and execution of the course, followed by extensive evaluation. In the conclusion, we cite findings and guidelines for the future, which we have decided on based on the evaluation.

EtnoFletno: Slovenian Folk Song on the Web and Mobile Applications

Sandi Gec, Tadej Mittoni, Ciril Bohak, Matija Marolt, University of Ljubljana, Faculty of Computer and Information Science

Gregor Strle, Research Centre of the Slovenian Academy of Sciences and Arts, Institute of Ethnomusicology

The paper presents EtnoFletno, a mobile and web platform of Slovenian folk songs. The aim is to revive our connection to folk song and music, and, based on modern technologies, bring it closer to younger generations. EtnoFletno is fast, responsive and functional, accessible on

all major mobile platforms and web browsers. It uses a three-tier, scalable architecture and offers standard search and browsing, as well as more advanced interfaces such as query-by-humming.

The use of algorithms in generating algorithmic music

Lorena Mihelač, School centre Novo mesto

The article discusses the algorithm as one of the possible strategies to create music compositions. It shows two processes of creating an algorithm for a music composition, without and with using a computer. With the introduction of the algorithm in the field of music, the author wanted to show the students the broad applicability of algorithms for solving similar problems in other school subjects as for solving problems that are present in everyday life of each individual respectively.

Slovangea - cross-curricular integration in the internet environment

Katja Knific, Maruša Bogataj, Primary school Predoslje Kranj

Our contribution presents examples of cross-curricular integration between Slovene, English and Geography. Such integration helps teachers and students to cooperate in a better way. Ways of participating in teaching and learning can be different. We are presenting cross-curricular integration in the internet environment called Mahara.

The main common aim of our cross-curricular integration was to encourage and stimulate our students to think in a more critical way with the help of formative assessment. They were working in pairs and groups, expressing their own opinion and thoughts, sharing them with their school friends, all to improve their critical thinking. They were more and more successful. They shared their ideas and work in Mahara. They had some difficulties placing the aims and the strategies how to achieve the aims at the beginning. But step by step thinking and discussing about it and about their work their motivation to improve it became stronger. So did the satisfaction at the end of their work.

We will present our work through three different tasks: a board game *Slovangea mania*, an exhibition of poems written and made by our students, and a signpost of Slovenian traditional food.

How Motivating Third Year Pupils for Creative Writing through the Computer Education?

Mateja Chvatal, Domžale primary school

Teachers are increasingly emphasising that pupils' creativity is derived

less from innate talent and much more significantly from motivation. If pupils are sufficiently motivated for a particular activity, they will naturally engage in it again and again, developing their skill and understanding. My personal experience confirms this as well – I have been leading after-school programmes for third-year pupils. During one whole year, my pupils have been using the Story Jumper computer programme. They have been expressing positive feelings such as joy, success and contentment, which are necessary conditions for independent creative work and developing critical thought. As I have found out, the computer has been a learning aid for them also during their free time at home.

Voicethread: motivation, creativity and learner empowerment in TEFL in elementary school

Aleksandar Tonic, Primary school Tomo Brejc

The fast development of information and communication technology (ICT) and its inclusion into teaching English as a foreign language (TEFL) demands a high level of flexibility on the teacher's part and presents quite a challenge for many teachers of English. Successful integration of ICT into TEFL may result in a powerful learning environment which has a positive effect on learning, motivation, critical thinking and learner autonomy while bringing learners to the goals they had set to achieve with their teacher in a different and fun way.

The paper presents the online application called Voicethread as an example of use of ICT in extra lessons of TEFL in the 7th grade. Voicethread joins various media (pictures, sound, documents, and written comments) in a cloud-based environment. It motivates learners to work independently while empowering them and enabling them to reach higher skills in the cognitive domain.

A picture is worth a thousand words – using infographics in foreign language acquisition

Alan Paradiž, Šmartno pod Šmarno goro primary school

Abstract. A 21st century teacher does not help a learner only to learn, but also understands their needs to learn and takes them into consideration when preparing lessons. With the emergence of the IC technology and internet, a teacher has also obtained a role of an e-class organizer, manager, moderator and facilitator of a learning process; someone who uses the advantages of internet sources in classroom in order to boost

learning process. Using infographics as a medium helps students acquire language (and develop all four skills; i.e. reading, speaking, listening and writing) and is an innovative teaching approach that centers on learners. However, it does not require a teacher's high level of computer literacy. It may serve as a lead-in aid, a platform for discussion, a food for thought at the end of a lesson or a base of an oral presentation, which is also the main objective and focus (via juxtaposition with a typical power point presentation) of the present paper.

Mobile phones as teaching aid in German lessons

Sofija Baškarad, Primary school Dob

Many pupils in the last three grades of primary school have at least one mobile phone or smartphone. Mobile phones take significant impact on the pupil's daily life what will certainly lead to the use of mobile phones in school in the future. Mobile phones have the potential to new learning scenarios, because smart phones combine the functions (camera, audio player, internet browser, apps ...), which can enrich learning in the school. The background of using mobile phones is formed by so-called mobile learning. The added value of using mobile phones in the German lessons is to create new learning scenarios which are not linked only to the school space, furthermore, they infiltrate into the students' real life.

Raising Security Awareness of Users of mobile devices - SecCyb

Igor Bernik, University of Maribor, Faculty of Criminal Justice and Security

Lack of users knowledge on the safe use of computers and mobile devices (smartphones, tablets etc.) working in the cyberspace means exposure to many threats. As the situation in the field of mobile devices is critical in terms of risk, raising awareness of users is almost completely overlooked. We exploit opportunity with the untapped potential of interactive e-services, upgraded with mobile applications that users playfully take through the process of raising security awareness and knowledge how to protect devices.

Assesment as part of formative following of students progress

Sanja Leben Jazbec, Primary school Solkan

Formative assessment is a specific way of behaving both, a learner and a teacher, who plan the whole learning process together. Learning is

therefore a personal and a collective process of both. Evaluating as a part of formative assessment is constant and prospective. The outcomes of evaluating are the basis for the learner to think about his learning and decide for the next steps. On the other hand, the outcomes are the base for the teacher to modify his teaching, if it is necessary, and to encourage the learner for the future activities in order to fill the gaps and to eliminate imperfections. Interactive student book for Slovene language is learning opportunity that learners co-create with their teacher.

**Active learning in a “Introduction to networks” course
Sophia Danesino, Istituto di Istruzione Superiore “Giuseppe Peano”, Torino, Italy**

There is significant evidence that profound learning occurs when students are involved in creating, sharing, interacting and explaining. Traditional lessons tend to be particularly ineffective in some types of teaching. Telling students how devices work or describing the process of networking transmission can be boring, difficult to remember, even hard to understand. It is necessary to find new approaches in order to involve students in the learning process so to increase their engagement and make them more motivated and autonomous. Starting from this assumption, two innovating teaching methods have been experimented at Peano Institute in Torino, Italy, with encouraging results. In this work, we describe the way we used to increase the amount of active learning in our “Introduction to networks” course of the third-year curriculum. After introducing these techniques in 2013 we observed an increase of interest and participation in our students. This result suggests that the adoption of active learning pedagogies can contribute to increase personal work and improve the learning process.

**Experiences of the T4T group in primary schools
Fabrizio Ferrari, Primary school De Amicis – IC Regio Parco, Torino, Italy
Alessandro Rabbone, Primary school R. D’Azeglio – DD R. D’Azeglio, Torino, Italy
Sandro Ruggiero, Primary school N. Tommaseo – IC Tommaseo, Torino, Italy**

In this paper we describe the experiences carried out in three different primary schools during several years with pupils in their third, fourth

and fifth grades (i.e. with pupils from 7 to 10 or 11 years old). The focus is on pro-gramming because we consider it a new tool for pupils to express their creativi-ty while they are learning fundamental elements of computer science. Obvious-ly suitable program development environments must be used, for example Scratch that is our choice for introducing programming. Our teacher experienc-es are focused on finding contributions to defining an interesting, affordable and sustainable school curriculum for CS in primary and lower secondary school. Such curriculum should introduce computing respecting the pedagogical achievements that have been identified by educators in the decades for the dif-ferent school grades, allowing pupils to perform new kinds of activities also to the benefit of those longtime recognized achievements.

Introducing recursion with LOGO in upper primary school

Ágnes Erdősné Németh, Batthyány Lajos Gimnázium, Nagykanizsa, Hungary

ELTE Faculty of Informatics, PhD School, Budapest, Hungary

Recursion is a powerful concept, but most of the students and teachers agree that it is difficult to learn, understand, and teach it. On the other hand, Logo is a powerful language that allows for explorations of recursion via visu-alization. This article demonstrates a new way of teaching and understanding recursion for the upper primary students with the help of Logo. The structure we used fits to the computational thinking approach, it helps to understand time and memory limits of computers, too. Understanding the key concepts of recur-sion prepares students for making sense of other types of programming con-cepts like memoization and dynamic programming and other more complex concepts.

ZaznajSpoznaj - a modifiable platform for accessibility and inclusion of visually-impaired elementary school children

Matevž Pesek, Daniel Kuhl, Matevž Baloh, Matija Marolt, University of Ljubljana, Faculty of Computer and Information Science

The educational and IT communities have produced a number of e-learning products, ranging from support-oriented platforms for online courses and learning to educational games. However, there is still a growing need for inclusive and accessible learning products. To meet

the need, we developed an accessible online web and mobile platform for educational games which are highly modifiable and applicative to any learning domain. The paper describes the platform, its agile development process, and first results of the platform's evaluation for the blind and visually impaired elementary school children.

Encouraging reading through ICT

Katarina Šulin, Primary school Vide Pregarc

The article shows how using ICT is an important encouragement to the pupils even when it comes to such a demanding task as reading. In order for the reader to experience the story, they need to be constantly active, following the text and connecting the information into a meaningful whole. I have noticed that in general the pupils do not enjoy reading books due to the effort that reading demands. It is much easier to be a passive observer and receiver, for example when watching television. That is why additional motivation for reading is essential. With this in mind I have, for the third consecutive year, organized a reading night at Vida Pregarc Primary School. It took place from Friday night to Saturday morning. ICT proved to be the main motivation for participation: the pupils took photographs, edited them, searched for instructions on the Internet and played them, and finally, evaluated the event.

Oral Presentation Using ICT Tools – More Than Oral Presentation

Maja Brezovar, Primary school Žiri

Knowledge evaluation means collecting information on how the student achieves the objectives or standards of knowledge. The article presents one of the ways of presentation of the acquired knowledge in Slovenian language and literature course, that is the student's oral presentation with the help of ICT tools, which then a teacher can evaluate and grade. According to the curriculum for Slovenian language and literature in primary school, examination rules and evaluation knowledge objectives, standards in primary education in general and modern lifestyle the preparation for oral presentation using ICT tools means different preparation than classical oral presentation as the very preparation itself to final implementation demands cross-curricular links among several different subject areas, it can exceed the curriculum, and at the same time the use of ICT tools can attract students to work with a range of online tools that are within (their) reach.

The lesson cross - curricular teaching music - astronomy

Vlasta Ratej, Marjan Kuhar, I. Primary school Celje

Nowadays it is almost impossible to imagine teaching without using information and communications technology in the classroom. ICT has proved to represent information exchange, limitless and timeless connections, and the raise of quality. Pupils are diverted from passive listening to active searching and connecting information.

Despite the variety of information flow there is still not enough emphasis on cross-curricular integration. The interdisciplinary connection between music and mathematics was presented two years ago. The current article presents the idea of connecting music and astronomy at the same time with a simple interactive presentation, thus demonstrating pupils how two seemingly different subjects can be connected in practice.

Creative Storytelling Through Lego Bricks

Nataša Sadar Šoba, Elementary school Vodmat

Lego bricks are some of the best known toys around the world. They encourage a child's creativity, imagination, construction and the sense of spatial design. In schools, they can be used not only as motivation to learn, but also for developing listening, speaking, reading, and writing skills as well as digital literacy. The Lego StoryStarter set with the computer program StoryVisualizer represents a major asset in teaching and learning in all grades of primary school. It encourages children's creativity since with the use of Lego bricks, children form stories, they narrate them and/or write them down. In the computer program, they can create comics, newspaper articles or picture books.

Algorithms and well formatted texts: Introducing Computer Science Activities in Lower Secondary Schools

Martina Palazzolo, Istituto Comprensivo Ilaria Alpi, Milan, Italy

In order to raise awareness on computational thinking among teachers in our lower secondary school, we started a collaboration with university (Universit  degli Studi di Milano, Computer Science Department) for a training. We invited a team of computer scientists in all our 6th and 7th grade classes asking them to carry out an unplugged activity with a computer based task (called 'algotricity'). The aim of the project was to engage pupils in a computer science activity, but even more important was to show teachers the potential of informatics for a computational thinking approach in math and science. We got positive results and teachers expressed their interest. Over the next year we

hope to continue this effort to gradually improve teacher self-competence, enable them to give the course themselves and gradually build up a new curriculum for mathematical and scientific area.

Blended Learning Environments, Flipped Class and Collaborative Activities to Teach Databases in a Secondary Technical School

Maria Concetta Brocato, ISIS Arturo Malignani, Udine, Italy

The paper describes some learning and collaborative activities, some tools and an on-line environment created to teach the Databases to secondary technical school students (aged 17-18). The on-line course, created by using the Learning Management System Moodle, is a blended learning environment to support daily classroom activities. The on-line environment increases dynamically with the contribution of teacher and students and “wraps around” the class during the learning process. The course allows "Flipped Classroom" and collaborative activity (online and classroom), it supports discussion and sharing information. It also enables students to have personal/sharing areas for files and supports the main cloud services to upload/download files. Topics of the course: modelling a database using the relational model, designing Entity/Relationship diagrams, SQL language, case studies based on real life and student scenarios.

Selected Spotlights on Informatics Education in Austrian Schools

Peter Micheuz, Barbara Sabitzer, Alpen-Adria University Klagenfurt, Austria

In this paper we take a look on Informatics education in Austrian primary and secondary schools. The development of two reference models for digital competence and Informatics education should be seen as a big conceptual step forward, but regarding its nationwide implementation there is still a long way to go. Further, we report on a promising local initiative in Informatics for primary education as an outreach program. Then the current status of the development of a “curriculum reform light” for the obligatory subject Informatics in the 9th grade is pointed out. And finally, a major reform of the school leaving exam (Matura) at academic secondary schools including Informatics has been implemented in 2015 for the first time. In the last chapter we reflect on its general conditions, first experiences and results.

The Cat, the Turtle, the Snake and GCD

Agnieszka Borowiecka, Katarzyna Olędzka, Computer Assisted Education and Information Technology Centre, Warsaw, Poland

In this paper, we discuss our proposition for the lessons of algorithmic in which we work with interactive projects. By playing and programming small applications students have the opportunity to understand an algorithm and become familiar with different ideas. Everyone learns effectively when acts (learning-by-doing), but it is even better when one is programming (learning-by-programming). Different approaches to the greatest common divisor problem (GCD) are presented from pedagogical perspective.

The renovation the school website and post-publication-process

Alenka Zabukovec, Saša Kastelic, Primary school Lousia Adamiča Grosuplje

At The Louis Adamič Primary School Grosuplje we decided to renovate the school website and post-publication-processes. The renovation was planned on the basis of theoretical and practical knowledge. We have successfully implemented the renovation and today we have a topical, modern website that offers to get high quality information on intuitive way to various publics. The article describes the process of renovation: a preparation for renovation, an implementation and an analysis with the plans for future work.

Monitoring student learning in the classroom with iTALC

Barbara Abram, Primary school Sečovelje

Nowadays modern lessons often take place in computer classrooms, which has many advantages and disadvantages. A useful didactical tool is presented in this article. iTALC 2.0.2 lets the teachers control other computers in their network in several ways. It enables the teachers to show a demo, to monitor their students' screens, to help the students and it enables to communicate with them easily.

Informatization of the Teacher Substitution Process

Marjan Kuhar, I. Primary school Celje

School processes have been computerised for quite a few years now. The role of our pupils has been changing from passive into an active one, at the same time teacher has changed from the one who only passes the knowledge to the one who directs, coordinates and moder-

ates the value of it. Lifelong learning is becoming a reality, the services of the school system are also changing and developing. One of the new ones is “eAsistent”, which is a complete information solution for primary and secondary schools.

One of the duties of a deputy headmaster is to find replacements for absent teachers. The article presents what this work used to be like before the use of “eAsistent”, how it works with using it and what are the advantages of the informatization of this very important process which ensures undisturbed teaching process at school.

Hidden effects of internet use on youth

Andrej Koložvari, France Prešeren primary school

Davorin Kofjač, University of Maribor, Faculty of Organizational Sciences

By observing the young in the tenth year of age, we want to know what they are doing in their free time. How to use ICT and the Internet affects their leisure. The achievements of science effect our life with changes. Often we come across statements, claiming that the use of new technologies causes the technological progress, changes in business process, stimulate general progress in society and consequently also cause the cultural change. The presence of new ideas, values and discoveries makes new life forms in the living space, new relationships, organizations and transactions. Extensive use of modern communications and internet has multiple effects on mankind and modern society. The greater part of young people participating in the questionnaire use the internet mostly for entertainment. We can sense them with time inter-spaces of different lengths. It can also bare unplanned effects for the general society, such as passiveness and inflation of moral values. It is our duty to handle children and youngsters with proper concern for them to become active users.

Modern teaching of natural sciences using flexible measurement system with open source software - eEksperiments

Dejan Križaj, Marko Meža, Borut Pečar, University of Ljubljana, Faculty of Electrical Engineering

Jurij Bajc, University of Ljubljana, Faculty of Education

Alenka Kavčič, University of Ljubljana, Faculty of Computer and Information Science

The paper describes the project named eEksperimenti (eExperiments)

aimed in development of a measurement platform based on an open source computer-measurement card Red Pitaya. It can be used for creative teaching and learning of natural sciences and technologies in primary and secondary schools. On the web based platform basic electrical terms and principles of measurements using computer-measurement card Red Pitaya are described. Several experiments with full didactical support are developed for more and less skilled users. In order to address users with different skills each experiment is divided into three levels of difficulty. In addition several applications for acquisition of data from several sensors such as photo sensor, temperature sensor, accelerometer, magnetic field sensor are developed. The platform enables design of new creative experiments to be run by teachers as well as students and pupils themselves.

Roboval: Robot Contest and Education with Arduino in High School

Maurizio Boscaini, High School G. Marconi, Verona, Department of Computer Science, University of Verona, Italy

Alberto Valente, Plumake Srl, Grezzana (VR), Verona FabLab, Grezzana (VR), Italy

In this paper we describe an experience of educational robotics in high school for Roboval, an annual fair organized by Verona FabLab that takes place in Verona (in the north of Italy) about robotics, innovations, and makers. Our focus will be on the learning and technical aspects. The aim is to form some student teams to participate in contests with a robot built by themselves. All the teams have to deal with software, in particular the programming of the Arduino system, and to take care of practical aspects. Some teams also have the opportunity to tinker the pieces together or to repair the hardware. The learning skills provided by this experience are varied and interesting. The theory is important but stays quietly in the background, while practice and collaboration play the main role.

A Cautious Look at Coding in Primary Education

Peter K. Antonitsch, Alpen-Adria Universität Klagenfurt, Institut für Informatikdidaktik, Austria

New programming environments try to attract younger and younger children to computers in general and coding and programming in particular, claiming to foster their intellectual development. Others warn by

pointing at developmental risks if children are exposed to virtual environments at too young an age. This article reports on a small scaled research project at primary level, indicating that both viewpoints might have their justification, but also points at coding being some special case.

Adapted programming education for visually impaired

Mario Konecki, Faculty of Organization and Informatics, Croatia

Programming is a backbone of modern society. The constant need for more professional programmers is present and growing. In order to produce such high number of quality programmers, all computer science studies must provide their students with well-formed curriculum and methods of teaching programming that will give usable results. Programming is abstract and hard for novices to learn. Students as well as their teachers struggle in every generation of students to achieve successful passing rates in programming courses. Students are not used to abstract way of thinking and to learn and teach programming proves to be a very challenging task. This task is even harder in the case of visually impaired students who have to remember the whole program and its context. Learning abstract programming concepts is also much harder for visually impaired students who rely on purely audio descriptions, compared to their sighted colleagues who are able to learn from various graphical illustrations and animations. In this paper a discussion about the approach that would be suitable for visually impaired programming novices is given, along with directions for future research.

Conceptual learning of photosynthesis by using computer games

Miha Povšič, Srednja šola Jesenice

Teaching in schools changes daily. Teachers hoping to optimize the transmission of knowledge are testing new and new teaching methods that would motivate students and give them long-term knowledge. Youth spend most of their free time at the computer feeling safe and very secure there. So why not introducing the content which is difficult for students to understand by using the computer. Acquiring knowledge through conceptual learning has been repeatedly proven to be very effective in understanding complex concepts. Through the use of computer games students create conceptual folders, which simplifies photosynthesis and brings it closer to them.

Adaptive drum kit learning system: User interface properties and features

Mladen Konecki, Faculty of Organization and Informatics, Croatia

Many people would like to learn how to play a musical instrument. Unfortunately, many of them never do. There are numerous reasons for that: lack of time, lack of motivation, absence of music school in near area, etc. Computer technology can be used to overcome some of these issues. In this paper the answers on questions about what features and properties user interface of adaptive drum kit learning system should have are presented and elaborated. Research results, along with possible solutions based on previous research, are presented and discussed.

Using ICT in teaching children with special needs

Marija Mohar, Primary school Gradec

In everyday teaching children with special needs is using ICT of great help. Even when learning children with special needs, its use is very broad and useful in very different ways. Everyday we are faced with new challenges that give us new ideas for its use. The effects of use are very diverse and working in this way is popular among students.

Teaching with Animation Monkey Jam

Miroslava Minić, Primary school Dobje

How to motivate young learners to learn and how to make learning reasonable? What are young learners interested in and what do they like to do? These are the questions that led me to searching for novelties and innovations in young-learners teaching. Therefore I decided to implement teaching with animation Monkey Jam into my lessons. I combined teaching with the use of information communication technology and motivated students to co-operate.

Monkey Jam is a digital and stop motion animation program. It is designed to let you capture images from a webcam, camcorder, or scanner and assemble them as separate frames of an animation. You can also import images and sound files that are already on your computer. Although it is designed for pencil and paper, Monkey Jam can also be used for Stop Motion animation and has several features just for that. Movies created in Monkey Jam can be exported as AVI files.

This is good material for a class project or group work as it gives the learners a great sense of achievement seeing the movie rolling. Its re-

sults can be imported into Movie Maker, if you want to combine them with live footage shot with a video camera.

It can be used to create animations for teaching in the classroom.

Universal voice e-reader for the Slovenian language as a personal learning tool for people with dyslexia and different types of visual disturbances

Tomaž Šef, Department of Intelligent Systems, Institut »Jožef Stefan«

Dyslexia is a disorder of reading skills or reading comprehension, often with a tendency to mangle letters or words while reading or writing, or not to notice certain letters or words. Experts note that cases of this disorder are always greater, and the portion of children having the disorder is 5 - 10 %.

Various packages for e-learning and self-help tools are available for people with dyslexia.. The most advanced software already allows adjustments to their special needs. The most important language dependent module is speech synthesizer. Here we encounter two problems: insufficient quality of artificially generated speech and poor support for various mobile platforms, integrated as a core function in the mobile's operating system.

Presented e-service DysLex allows the inclusion of all Slovenian speech synthesizers (both free and commercial, which are included as core functions in the mobile's operating system. It is designed as a service in the cloud and associated mobile application. The solution enables connectivity of the speech synthesizer with any program and has been proven to be the most efficient for dyslexics and the visually impaired as it expedites the need for costly development of various specific applications

Application for Alternative and Augmentative Communication MojKomunikator

Vlasta Lah, Tina Črnič, Elementary school of Milka Šobar – Nataša

MojKomunikator is the first mobile application for augmentative and alternative communication with pre-loaded words and communication patterns in Slovenian language. The mobile application MojKomunikator allows and aids communication to people who, for various reasons, are unable to speak. It can also be used as a tool for learning and revis-

ing words in Slovenian language. Users require no prior knowledge as the application is simple and easy to use. The application works on a variety of platforms. It is available in Web stores free of charge and as a Web application on the Web site <https://www.mojkomunikator.si/>. In this contribution, we present more details regarding the application MojKomunikator in terms of its content, design, features, and customization options.

Metis: system for early recognition of learning problems

Damjan Kužnar, Miha Mlakar, Erik Dovgan, Jernej Zupančič, Boštjan Kaluža, Matjaž Gams, Institut "Jožef Stefan"

A new system Metis for early recognition of learning problems is presented in the paper. Using algorithms of artificial intelligence and machine learning based on indicators of learning success it identifies pupils with increased risk of problems in the education process. Those pupils are then referred to experts who conduct individual consultations with each pupil and prepare a suitable programme of measures. Pupils follow their programmes using mobile phones which serve as an interface that shows reminders, improvements and achievements.

Enhancing digital literacy also in the hospital school

Mojca Stergar, Aleksandra Vadjal, Primary school Dekani

Constant changes in the society demand an individual who is able to adapt fast and efficiently as well as to create them with his/her knowledge. Children are exposed almost from their birth to tablet computers, laptops, smartphones etc. their parents use to entertain them. So they are quite familiar with them when they enter school. A teacher has thus a possibility to use their acquired knowledge and to increase it introducing activities that enhance digital literacy. Children seeking medical treatment at the hospital very often bring along the aforementioned tools, so teachers in the hospital school frequently use them to plan lessons. Thoughtful approaches and appropriately planned activities make a hospital school a suitable environment to promote and develop digital literacy.

| ISSEP 2015 Schedule – Summary | | | |
|------------------------------------|---|--|---|
| Monday, Sept 28 | Tuesday, Sept 29 | Wednesday, Sept 30 | Thursday, Oct 1 |
| 8:45 – 9:00 Opening remarks | 8:00 – 9:00 Registration | | |
| 9:00 – 10:45 VIVID | 9:00 – 10:00 Official opening | 9:00 – 10:00 Plenary talk Tim Bell | 9:00 – 10:00 Plenary talk Maria Knobelsdorf |
| | 10:00 – 11:00 Plenary talk Miha Kos | 10:00 – 10:20 Coffee break | 10:00 – 10:20 Coffee break |
| 10:45 – 11:15 Coffee break | 11:00 – 11:20 Coffee break | 10:20 – 11:45 ISSEP | 10:30 – 11:35 ISSEP |
| 11:15 – 13:00 VIVID | 11:20 – 12:20 ISSEP, VIVID | 11:45 – 12:00 Coffee break | 11:35 – 11:50 Coffee break |
| | 12:20 – 13:30 Poster fast forward | 12:00 – 13:30 ISSEP | 11:50 – 12:55 ISSEP |
| 13:00 – 14:30 Lunch | 13:30 – 14:30 Lunch | 13:30 – 14:30 Lunch | 13:00 – 14:30 Lunch |
| 14:30 – 15:30 VIVID | 14:30 – 15:35 ISSEP, VIVID | 14:30 – 16:00 ISSEP, Workshop | 14:30 – 16:35 ISSEP |
| 15:30 – 16:00 Coffee break | 15:45 – 16:45 Special presentation | | |
| 16:00 – 17:45 VIVID, Workshop | 16:45 – 17:00 Coffee break | 16:00 – 18:00 Excursion | 16:45 – 17:00 Conference closing |
| | 17:00 – 18:30 VIVID, Workshop | | 17:00 – 19:00 Round table |
| 18:00 – 19:00 Welcome reception | | | |
| | 19:00 – 20:00 Business meeting | 19:00 – 23:00 Conference dinner | |

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